

Introduction

Categories of Life

Ayo Wahlberg and Susanne Bauer

Oncomouse, intracytoplasmic sperm injection, foetal scans, gene chips. These have been some of the iconic images used to capture and convey, for some, a sense of rapid advance, progress and hope, while for others, a sense of abomination, fear and anxiety in life sciences research. Whether or not we are about to enter a bio-age, a posthuman future or an era of genetic programming, developments in the 'new' life sciences have come to feature prominently in discussions and debates about humanity's future. It is little wonder then that social scientists have taken to this emerging field and its attendant controversies, scandals, slippery slopes, possibilities, promises and hopes. Yet, the suggestion is that social studies of the life sciences mark a break with philosophical and bioethical engagements with the same. If the latter are concerned with principles of autonomy, authenticity, beneficence, justice and dignity when developing their arguments, the former engage with empirical sites such as laboratories, clinics, biotech companies, patient groups, families and policy making arenas. As always, however, the break is not so neat. Some social scientists have long pointed to injustices and dangers in scientific and medical practice while some philosophers and ethicists have advocated for a more 'grounded' form of empirical or applied bioethics.

As such, when scoping the growing field of life sciences in society studies, it is perhaps more useful to distinguish not so much between philosophic and empirical approaches to engaging with the life sciences, but rather between the hazards and promises that have been attributed to the life sciences as well as the tensions and interactions between them. Developments in the life sciences are seen, on the one hand, as dangerous when leading to eugenic slippery slopes, irresponsible hype, dissolutions of authenticity, clandestine body parts markets and exploitations of desperation. Francis Fukuyama (2002), Jürgen Habermas (2003), Leon Kass (President's Council on Bioethics 2003), Troy Duster (2003) and many others have highlighted concerns about troubling tendencies in biological research. For these writers there is a sense that new technological possibilities for cognitive enhancement, reproductive selection and genetic manipulation are putting our very human nature, dignity and authenticity on the line while also reinforcing social inequities. From a more empirical perspective, Nancy Scheper-Hughes (2002), Kaushik Sunder Rajan (2006), Catherine Waldby (2006) and Adriana Petryna (2006) have highlighted the dark side of bioscience and the taxing toll of globalized organ, gamete, blood and tissue trade, postgenomic research as well

as clinical trials especially on socio-economically and/or medically vulnerable human subjects. Still others have warned of alienating and exploitative effects of processes of geneticization, biologization and commodification that the life sciences are seen to have put in motion as well as of distorting and corrupting effects of media-led hyping of life science research (Lippman 1992; Nightingale and Martin 2004; Rose et al. 1984; Shiva 1997). The emphasis in these accounts is again on the social inequities that surround global bioscientific and biomedical practices.

On the other hand, life sciences research is seen as promissory when bringing scientists, clinicians, venture capitalists, patients and families together in a common quest to save and improve lives. Far from approaching developments in advanced life sciences with trepidation, posthumanist and transhumanist theorists have embraced new (future) possibilities for enhancement, immortality, and expansion of human capacities to promote 'personal growth beyond our current biological limitations' (World Transhumanist Association 2002). For these theorists, the promise of bioscience is utopian and arguments are often more hypothetically than empirically informed. At the same time, a number of empirical social studies of the life sciences have also highlighted the promissory nature of bioscience (Brown et al. 2006), albeit against a backdrop of the potentially negative consequences of hype, not to mention potential exploitation of human subjects. These include empirical accounts of how bio-social communities and biological/genetic/pharmaceutical citizens have emerged out of these new configurations of governing life as individuals and groups coalesce around common vital objectives (Ecks 2005; Gibbon and Novas 2007; Heath et al. 2004; Koch and Hoeyer 2006; Rose and Novas 2005). Moreover, ethnographic studies have showed how new reproductive technologies, new genetics and neuroscience can destabilize and transform self understandings and worldviews, while also mobilizing communities and individuals (Franklin 1997; Franklin and Lock 2003; Konrad 2005; Pálsson 2007; Rapp 1999; Vrecko 2006).

Whether hazards or promises are highlighted, there is nonetheless broad agreement that bioscience and biotechnology are impacting on human lives, and in the process, generating new forms of knowledge, subjectivity, capital and value. Some have argued that 'life itself' at the level of tissues, cells, DNA and molecules is being transformed through genetic reprogramming or cellular recapitulation, further troubling any supposed nature/culture divide (Franklin et al. 2000; Rabinow 1996; 1999; Rose 2006). Sarah Franklin says of Dolly, the world's first 'cloned' sheep: 'It is difficult to get to grips with Dolly because she slips out of familiar kinds; her existence does not parse within familiar categories, or, rather, when she is fitted into them, they must twist and change to accommodate her unprecedented existence' (Franklin 2007: 28). Others have stressed the entanglements and simultaneity of nature/culture with the hybrids and heterogeneous assemblages of biocultures, biosociality and citizenship that are found when studying the sciences in society empirically (Latour 1993; Ong and Collier 2005).

It has also been suggested that a bio-economy, complete with new regimes of biocapital (Sunder Rajan 2006) and forms of biovalue (Waldby 2002; Waldby and Mitchell 2006), has emerged as ‘vitality can now be decomposed, stabilized, frozen, banked, stored, commoditized, accumulated, exchanged, traded across time, across space, across organs and species, across diverse contexts and enterprises in the service of both health and wealth’ (Rose 2007: 3). At the same time, new regimes for the governance of life technologies and science have emerged throughout the world albeit in different national and local forms (Gottweis et al. 2008; Jasanoff 2005). National ethics commissions, participatory consultations, ethical review boards, informed consent procedures, bioethical regulations and codes of conduct have been established in various conglomerations in order to navigate and negotiate the tensions between bioscience’s dangers and promises, especially so in a context of scientific uncertainty. Beyond these new forms of capital and regimes of governance, the biosciences have also been shown to alter subjectivities and subject constitution in everyday life, as they are negotiated through a broad range of social practices from healthcare, reproductive technologies and the entry of biotechnologies into everyday lives through pharmaceuticals, GM foods and forms of personalized genetic testing.

Stabilization and contestation

Beyond the concern, fascination and hope that 21st century biosciences have evoked, the collection of studies of life sciences in society found in *Contested Categories* seeks to shift empirical focus from actor-networks, biological citizens, bio-cultures, bio-social communities, bio-economies or bio-governance regimes, to the categories that have both organized and emerged out of life sciences practice. While these former elements certainly feature in the chapters of this book, there is a clear focus on how life science categories come into play in clinical, laboratory, policy, public or personal contexts and in doing so how these can be transformed as well as take on new meanings. The aim is to relocate social inquiry from a domain of hazard-promise to ones of contestation-stabilization and negotiation-reconfiguration.

The chapters present a series of empirical studies that engage with the often shifting and day-to-day realities of life sciences categories as they circulate, inform practice and transform clinics, laboratories, policy arenas as well as public imaginations. Life sciences knowledge is something that is often produced through practice in the restricted sites of laboratories where humans, animals and other non-human actants form complex networks of experiment and data. Yet resulting biomedical categories of embryos, fetuses, genes, human biological materials, serious disease or genetic risk are never ‘merely’ technical, as they stray, acquire social identities and meanings as well as perform symbolic tasks in public debates, clinical settings or in doctor-patient interactions. Categories and categorization processes in life science research and practice are crucial in the sense that they

allow certain objects to be grouped together, certain standards for practice to be formulated, certain limits or boundaries to be proscribed and also certain symbolic understandings to co-circulate among clinicians, patients, scientists and others. Yet, the practical stabilization that routines, regulations, codes of conduct or laboratory protocols afford is never shielded from contestation and negotiation, for example, through clinical encounters, mediated 'public understandings' or informed consent processes.

As such, it is with interlinkages between classifications, concepts, objects, boundaries, practices, understandings and subjects that the chapters in this book engage. Together, these chapters show, from different methodological and theoretical perspectives, how categories of life come to be taken up, contested as well as stabilized in laboratory settings, clinics and public domains. Categories and categorization processes play an important part in boundary-work, classification and taxonomy from bench to bedside, and a key theme emerging from this volume is that of tensions between, on the one hand, the necessity of more or less stable and fixed categories in organizing and guiding laboratory and clinical practice, and on the other, the flexibility and arbitrariness of such categories as they circulate. There is a constant interplay between contestation and stabilization of categories, as these are negotiated and reconfigured in diverse settings.

According to the Oxford English Dictionary, categories, in their most general sense, are terms given to certain *classes* of terms, things, or notions. They invoke similarity, relationship and kindness, while also demarcating, restricting and shielding. They form the parts of whole nomenclatures or taxonomies, i.e. systems of rational ordering, complete with logics and criteria of inclusion and exclusion. For many philosophers they are considered foundational for human experience and social scientists have long pointed to 'the tendency of mankind to classify out the universe' (Tylor 1899 cited in Lévi-Strauss 1969: 13) arguing that 'any classification is superior to chaos and even a classification at the level of sensible properties is a step towards rational ordering' (Lévi-Strauss 1966: 15). For Michel Foucault, this 'order is, at one and the same time, that which is given in things as their inner law, the hidden network that determines the way they confront one another, and also that which has no existence except in the grid created by a glance, an examination, a language; and it is only in the blank spaces of this grid that order manifests itself in depth as though already there, waiting in silence for the moment of its expression' (Foucault 1970: xx). At the same time, these very grids that underpin modern epistemologies and their ordering devices are historically and locally contingent. Different kinds of taxonomies perform different works of categorization; thinking in categories can be both flexible and rigid, imposing rules and boundaries which become negotiable as categories travel beyond localized spheres of practice.

As Bowker and Star (1999) have shown, the building up of ordered systems of classification requires a certain kind of work; they are of course not 'already there'. Instead they depend on infrastructures, technologies of classification, coding charts, indexes, computers, and the like. As they see it, categories 'arise from work

and from other kinds of organized activity, including the conflicts over meaning that occur when multiple groups fight over the nature of a classification system and its categories' (Bowker and Star 1999: 285). There are boundaries to be maintained and exclusivities to be protected, yet 'boundary objects' are those that 'inhabit several communities of practices and satisfy the informational requirements of each of them' (ibid.: 297). Analytically scaling those up to the level of society from local and mundane practices leads to descriptions of whole 'boundary infrastructures' which form the grids of modern epistemologies, for perceptions as well as practices. Ubiquitous and infrastructural, categories according to Bowker and Star are something between a thing and an action, and they suggest that *categorical work* consists of 'the juggling of meanings (memberships and naturalizations)' (ibid.: 310). Categories touch things as much as people's lives; they can be extremely powerful yet also ambiguous and negotiable.

When analysing the history of statistical classifications of multiple personality as a disease category, Ian Hacking points to the subdivisions and rearrangements generated by practices of counting, as they create 'new slots [...] in which to fit and enumerate people' as well as 'new ways for people to be' (Hacking 1986: 223). His stories about 'making up people' by categories are always multiple; they can work as labelling from above but also from below as 'numerous kinds of human beings and human acts come into being hand in hand with our invention of the categories labelling them' (ibid.: 236). While it is always humans who do this work of classifying and categorizing, Hacking proposes a, albeit not too rigid, distinction between 'natural kinds' and 'human kinds'. 'It makes no difference to either mud or a mud puddle to call it "mud"' whereas 'classifying people works on people, changes them, and can even change their past' (Hacking 1995: 367, 369). This is Hacking's 'looping effect' whereby classifications of humans changes self-conception and behaviour which in turn demands revisions of classifications and theories, and so forth. His point reminds us that however 'exclusive' the work of classification might be to experts, technocrats and scientists in modern society, the effects of this work as classificatory systems and categories feed back into clinics, laboratories, parliaments, households and other 'human' settings can be personal and intimate.

Medical anthropologists have ventured for some time now that categories and classification systems themselves perform a certain amount of 'work' by providing individuals with ways of relating to, understanding and working upon their selves and others. They can, in a sense, be liberating or empowering when helping patients to 'make sense' of their situation by providing them with metaphors and symbols while also proposing purposive remedial actions (Kleinman 1988). Yet, they can also be divisive, exclusionary, subjugating or stigmatizing if used to compartmentalize certain people as deviant, criminal, poor, sick or apathetic (Becker 1963; Foucault 1967; Goffman 1968). The point being that when categories group together things human (be they social, cultural, biological or economic 'things'), there is a certain reflexive interaction, looping or choreography between categories and persons

(their self-understandings, worldviews, lifeworlds, etc.) (Hacking 1986; Rose 2003; Thompson 2005).

Not only do categories and classifications inform grids of intelligibility and ‘ways of being’, they also inform ‘ways of doing’ in the form of clinical guidelines, laboratory protocols, good clinical practice criteria as well as more informal norms of practice in particular settings. The relations between ways of knowing and ways of doing have been central to Bachelard’s (1984) notion of phenomenotechnology in his studies of what he saw as the ‘technical activity’ of thought carried out by chemists and physicists in their laboratories, as well as to Canguilhem’s (1989) work on the role of biological concepts (e.g. of the normal, the pathological, the reflex or biological regulation) in experimentation and theorization. For Bachelard, realism and rationalism are not to be taken as opposites, rather each scientific experiment has to be approached as both a demonstration and an application so as to reduce ‘the gap between explicated reality and applied thought’ – ‘to the extent that hypotheses have been linked to experiment, they must be considered just as real as the experiments themselves – they are “realized”’ (Bachelard 1984: 10, 6). And for Canguilhem, it is the concept that is crucial in the development of methods of objectification for the very practical ‘work’ that it performs, not just in developing certain codes of observation or conventions of experimentation, but also in making experimentally-observed phenomena intelligible and practicable. It is the logic made possible by the concept that allows for and organizes practices of classification in the laboratory or clinic.

What is more, we have also learned from some four decades of laboratory ethnographies and science and technology studies how scientific facts are made and diseases are enacted through practices of biopsy, bioassay, cell culture, polymerase chain reaction, diagnosis, treatment, counselling and care (Latour 1987; Latour et al. 1986; Lynch 1993; Mol 2003; Pickering 1995; Rabinow 1999). Such studies have shown how inscription devices and ‘blackboxing’ are indispensable to the stabilization of statements and immutable mobiles in scientific practice. Yet they have also shown how blurred boundaries can create ambiguities, for example, when ‘brain death’ is diagnosed using apnea or doll’s eye tests (Lock 2002), and also how there can be multiple stabilizations at play, for example, when it comes to ‘doing disease’: ‘ontology in medical practice is bound to a specific site and situation. In a single medical building there *are* many different arteroscleroses... [yet] although arterosclerosis in the hospital comes in different versions, these somehow hang together’ through a kind of coordination between lab technicians, machines, doctors, nurses, patients and others (Mol 2003: 55, 84). Categories cannot be detached from the mundane practices that they rely on.

Substances, processes and sites

In the chapters that follow, authors explore how life science categories and classifications come to be stabilized, contested, negotiated and reconfigured in

a variety of different settings and sites, from museums featuring human tissue collections, oncology laboratories carrying out molecular analysis of cervical tumours, prenatal clinics, medical and scientific journals, popular literature as well as patient pamphlets and parent guides. They show how fixity can be hard to pin down, for example, when negotiating whether a foetus is a person, when maintaining the boundaries of a research site through strict protocols of research supervision or when contesting the classification of particular fossil remains as human. But they also show how necessary such fixity and order are for communication and negotiation through formalized procedures, guidelines and regulations as well as more informal conventions and norms.

All chapters share an empirical concern with how categories of life as well as categorization processes unfold in different contexts and settings. Methodologies and theoretical approaches are, however, not necessarily shared. While some authors have carried out ethnographic research in clinics, laboratories and anatomy and pathology museum collections, others examine and analyse scientific and popular media, patient literature or scientific journals. Some have interviewed patients and 'laypersons', others have interviewed scientists and clinicians and still others have interviewed none. This diversity is intentional, serving to underline the heterogeneity and pervasiveness of categories of life in contemporary society not only in regulations, texts and protocols, but also among people in their everyday lives. While we would not want to limit the breadth and depth of analysis in each chapter, we will point to four themes which consistently crop up, however fleetingly, throughout.

While 'life' is certainly not something exclusive to humanity, the chapters in this book do exclusively examine categories of human life. Indeed, Murray Goulden and Andrew Balmer (this volume) show us how politically contested and charged scientific demarcations of humans from animals can be through their analysis of controversies surrounding the classification of Piltdown man in the 19th century and *homo floriensis* in the 21st. To taxonomize archaeologically discovered remains under the *homo* family, we learn, is more ambiguous than the formalized classification systems that govern such species taxonomies might suggest. In her analysis of the troublesome nature of Human Biological Material (HBM) Cecily Palmer (this volume) shows us how biological material originating from humans (as opposed to from plants or animals) is negotiated as something 'different' or 'special' that begs controversies around dignity and respect, with profound implications for how it is stored, used and/or disposed of. The category of 'human', it seems, is something that needs protecting and shielding from outside incursions perhaps especially because it is seen to bestow certain qualities on biological objects, materials or species. It is a form of respect for human life that is also evident in distinctions between 'red' and 'green' biotechnology, between genetically modified foods/animals and bans on cloning and genetic modification of humans as well as between informed consent and coercion.

A second theme common to a number of chapters are the negotiations that infuse lived or 'lay' experiences with and of biomedical and biological knowledge,

materials and substances. Malin Noem Ravn (this volume) revisits bodily substances through an analysis of how a number of pregnant women in Norway think and talk about 'blood' and 'genes' as bodily matter as well as how these categories are seen to influence personal identity. She shows how 'blood' is often viewed in terms of movement, nourishment and intimacy whereas genes are talked about more in terms of fixity, individual core and uniqueness. Yet neither is seen as all-encompassing, leaving scope for individuality and socialization. Through her interviews with tissue collection curators, Cecily Palmer also shows how human biological materials emerge as boundary objects for researchers, oscillating between 'scientific artefact objects' and 'personified human entities'. As she puts it, human materials can become 'unruly' once removed from the body, as they become manipulable and probe-able artefacts yet must still be treated and utilized with respect. Through ethnographic participation and interviews at a prenatal clinic in Denmark, Nete Schwennesen and Lene Koch (this volume) examine the making of foetal life through its visualization, quantification and interpretation in routine prenatal care involving ultrasound scans, risk assessments and consultations, which they argue constitute a process of *matter-ing*. The visual representation of the foetus through ultrasound they argue, building on Karen Barad's theory of agential realism, is made meaningful to involved actors through intra-action between ultrasound technologies, clinicians, quantified risk assessments and expecting couples. Each of these ethnographic studies of life categories (blood, genes, foetus, human biological material), tell us something about how they come to be taken up and negotiated in the everyday contexts of tissue collection curators or expecting couples as biological knowledge, technologies, substances and objects acquire social meanings. However technologized, molecular, detached, numerical or laboratory-based life sciences are today, when human life is the object it seems 'depersonalization' is never complete.

The place of metaphors, concepts, norms and rationalities (grids of intelligibility) in the formation and circulation of categories such as 'at risk pregnancies', the 'body' or 'serious disease' forms a third trope found in a number of chapters. Adam Bencard (this volume) juxtaposes and parallels transformations of conceptual metaphors in the life sciences and in the humanities. He argues that both fields have, until recently, privileged informational metaphors which read the 'body as a text' as seen in the rise of the gene as the 'book of life' on the one hand, and the 'linguistic turn' in historical studies of the body on the other. Yet, in both cases, he suggests, informational models are being challenged through a blurring or complicating of the genetic 'code' by proteomics and systems biology, and a reframing of the body in terms of lived experience rather than discourse and language. From a clinical perspective, Ayo Wahlberg (this volume) also juxtaposes biological norms which emerge out of genetic understandings of conditions such as cystic fibrosis, spinal muscular atrophy and Down's syndrome, with the social norms that he suggests inform estimations of quality of life, severity and suffering. Through an analysis of patient literature and parents' guides aimed at couples who are contemplating or have undergone carrier testing, preimplantation genetic diagnosis or prenatal

diagnosis, and drawing on work by Canguilhem and Hacking, he argues that there is nothing in biology that can qualify a disease as serious, moderate or mild, as this latter task relies on negotiations between patients, parents and experts about what it is like 'living with a genetic condition'. From a historical perspective, Mianna Meskus (this volume) describes the institutionalization of prenatal testing and screening in the Finnish healthcare system over the last four decades. By reading Finnish life science journals, health policy documents and popular literature, she charts how rationalities of choice and risk (rather than population health or socio-economic cost reduction) came to organize prenatal screening and testing programmes in Finland with an emphasis on the autonomy and responsibility of pregnant women.

As noted earlier, the study of practices or 'ways of doing' has been a valuable approach when analysing the work of categorization in the life sciences field. A final motif in the empirical studies that follow is that of interlinkages between categories and particular 'ways of doing' scientific research or clinical practice. Through an in depth laboratory ethnography at a tumour genetics research site in India, Amrita Mishra (this volume) shows how laboratory settings are sites of negotiation of space and time regimes. Site access restrictions, spatial ordering within the laboratory, time schedules and virtual communication norms, she argues, all serve to co-produce a reliable and recognisable locale, and to protect it against incursions not only from 'outsiders' but also from possible contamination from within. The 'research laboratory' as a category is indispensable to life sciences work, and Mishra shows how its integrity and purity are constantly at stake. Susanne Bauer's chapter looks at the categorical work of epidemiological research practice. By analysing the levels of analyses and scales of investigation that are used in the science of population health, she shows how the seemingly fixed categories of population and individual, gene and environment, global and local are tied together in the research process, and circulate as deeply entangled or blended categories in society. Just as the social sciences operate through methodological conventions and 'epistemic communities' so too do the life sciences and biomedical practices, and as the chapters in this collection show, methodological innovation, conceptual development and 'discovery' are organized by categories which can become destabilized or reconfigured in the process.

Conclusions: Categories

The promise within the sub-title of this book is that the series of empirical studies found in *Contested Categories* should tell us something about life sciences in society. This is a problematic that, as noted in the opening pages of the introduction, has become both relevant and pressing for social scientists in recent years. We have suggested that, to date, it has been most common to locate life sciences within 21st century societies in terms of the hazards and hopes attributed to it. Life sciences

have been seen as both a threat to and a promising opportunity for societies, not only in the affluent 'West' but throughout the world.

The way we have collectively approached the task of examining life sciences in society in this book has been to ask how life science categories (such as 'genes', 'at risk pregnancies', 'laboratory', 'serious disease', 'foetus', 'human', 'human biological material' or 'population') circulate, not only within the restricted confines of laboratories, but also in broader contexts of clinical care, lay understanding, public discussion and academic debate. Where human life is at stake, there is constant interplay, feedback, coordination and choreography between grids of intelligibility, ways of being and forms of practice. And it is in these processes that boundaries, stabilizations and immutable mobiles are formed only to be contested and negotiated as they are taken up in different sites and contexts.

References

- Bachelard, G. 1984. *The New Scientific Spirit*. Boston, Mass.: Beacon Press.
- Becker, H.S. 1963. *Outsiders: Studies in the Sociology of Deviance*. London: Free Press of Glencoe.
- Bowker, G.C. and Star, S.L. 1999. *Sorting Things Out: Classification and Its Consequences*. Cambridge, Mass.: MIT Press.
- Brown, N., Kraft, A. and Martin, P. 2006. The promissory pasts of blood stem cells. *BioSocieties*, 1(3), 329–48.
- Canguilhem, G. 1989. *The Normal and the Pathological*. New York: Zone Books.
- Duster, T. 2003. *Backdoor to Eugenics*. New York: Routledge.
- Ecks, S. 2005. Pharmaceutical citizenship: antidepressant marketing and the promise of demarginalization in India. *Anthropology & Medicine*, 12(3), 239–54.
- Foucault, M. 1967. *Madness and Civilization: A History of Insanity in the Age of Reason*. London: Tavistock Publications.
- Foucault, M. 1970. *The Order of Things: An Archaeology of the Human Sciences*. London: Routledge.
- Franklin, S. 1997. *Embodied Progress: A Cultural Account of Assisted Conception*. London: Routledge.
- Franklin, S. 2007. *Dolly Mixtures: The Remaking of Genealogy*. Durham: Duke University Press.
- Franklin, S. and Lock, M. 2003. *Remaking Life & Death: Toward an Anthropology of the Biosciences*. Oxford: James Currey.
- Franklin, S., Stacey, J. and Lury, C. 2000. *Global Nature, Global Culture: Gender, Race and Life Itself*. London: Sage.
- Fukuyama, F. 2002. *Our Posthuman Future: Consequences of the Biotechnology Revolution*. New York: Farrar, Straus and Giroux.

- Gibbon, S. and Novas, C. 2007. *Biosocialities, Genetics and the Social Sciences: Making Biologies and Identities*. London: Routledge.
- Goffman, E. 1968. *Stigma: Notes on the Management of Spoiled Identity*. Harmondsworth: Penguin.
- Gottweis, H., Braun, K., Haila, Y., Hajer, M., Loeber, A., Metzler, I., Reynolds, L., Schultz, S. and Szerszynski, B. 2008. Participation and the new governance of life. *BioSocieties*, 3(3), 265–86.
- Habermas, J. 2003. *The Future of Human Nature*. Cambridge: Polity.
- Hacking, I. 1986. Making up people, in *Reconstructing Individualism: Autonomy, Individuality, and the Self in Western Thought*, edited by T. Heller et al. Stanford: Stanford University Press, 222–36
- Hacking, I. 1995. The looping effects of human kinds, in *Causal Cognition: A Multidisciplinary Debate*, edited by D. Sperber et al. Oxford: Clarendon Press, 351–94.
- Heath, D., Rapp, R. and Taussig, K.-S. 2004. Genetic citizenship, in *A Companion to the Anthropology of Politics*, edited by D. Nugent and J. Vincent. Malden, Mass.; Blackwell Publishing, 152–67.
- Heller, T., Sosna, M. and Wellberry, D. 1986. *Reconstructing Individualism: Autonomy, Individuality, and the Self in Western Thought*. Stanford: Stanford University Press.
- Jasanoff, S. 2005. *Designs on Nature: Science and Democracy in Europe and the United States*. Princeton, N.J.: Princeton University Press.
- Kleinman, A. 1988. *The Illness Narratives: Suffering, Healing, and the Human Condition*. New York: Basic Books.
- Koch, L. and Hoeyer, K. 2006. *Håbets teknologi: Samfundsvidenskabelige perspektiver på stamcelleforskning i Danmark*. Copenhagen: Munksgaard Danmark.
- Konrad, M. 2005. *Narrating the New Predictive Genetics: Ethics, Ethnography, and Science*, Cambridge: Cambridge University Press.
- Latour, B. 1987. *Science in Action: How to Follow Scientists and Engineers Through Society*. Cambridge, Mass.: Harvard University Press.
- Latour, B. 1993. *We Have Never Been Modern*. Hemel Hempstead: Harvester Wheatsheaf.
- Latour, B., Woolgar, S. and Salk, J. 1986. *Laboratory Life: The Construction of Scientific Facts*. Princeton, N.J.: Princeton University Press.
- Lévi-Strauss, C. 1966. *The Savage Mind*. Chicago: University of Chicago Press.
- Lévi-Strauss, C. 1969. *Totemism*, Harmondsworth: Penguin.
- Lippman, A. 1992. Led (astray) by genetic maps: the cartography of the human genome and health care. *Social Science and Medicine*, 35(12), 1469–76.
- Lock, M. 2002. *Twice Dead: Organ Transplants and the Reinvention of Death*. Berkeley: University of California Press.
- Lynch, M. 1993. *Scientific Practice and Ordinary Action: Ethnomethodology and Social Studies of Science*. Cambridge: Cambridge University Press.

- Mol, A. 2003. *The Body Multiple: Ontology in Medical Practice*. Durham, N.C.: Duke University Press.
- Nightingale, P. and Martin, P. 2004. The myth of the biotech revolution. *TRENDS in Biotechnology*, 22(1), 564–69.
- Ong, A. and Collier, S.J. 2005. *Global Assemblages: Technology, Politics, and Ethics as Anthropological Problems*. Malden, Mass.: Blackwell Publishing.
- Palsson, G. 2007. *Anthropology and the New Genetics*. Cambridge: Cambridge University Press.
- Petryna, A., Lakoff, A. and Kleinman, A. 2006. *Global Pharmaceuticals: Ethics, Markets, Practices*. Durham, N.C.: Duke University Press.
- Pickering, A. 1995. *The Mangle of Practice: Time, Agency, and Science*. Chicago: University of Chicago Press.
- President's Council on Bioethics. 2003. *Beyond Therapy: Biotechnology and the Pursuit of Happiness*. Washington, D.C.: Dana Press.
- Rabinow, P. 1996. *Essays on the Anthropology of Reason*. Princeton, N.J.: Princeton University Press.
- Rabinow, P. 1999. *French DNA: Trouble in Purgatory*. Chicago: University of Chicago Press.
- Rapp, R. 1999. *Testing Women, Testing the Fetus: The Social Impact of Amniocentesis in America*. New York: Routledge.
- Rose, N. 2003. Neurochemical selves. *Society*, 41(1), 46–59.
- Rose, N. 2006. *The Politics of Life Itself: Biomedicine, Power, and Subjectivity in the Twenty-First Century*. Princeton, N.J.: Princeton University Press.
- Rose, N. 2007. Molecular biopolitics, somatic ethics and the spirit of biocapital. *Social Theory and Health*, 5(1), 3–29.
- Rose, N. and Novas, C. 2005. Biological citizenship, in *Global Assemblages: Technology, Politics, and Ethics as Anthropological Problems*, edited by A. Ong and S. Collier. Oxford: Blackwell, 439–63.
- Rose, S.P.R., Kamin, L.J. and Lewontin, R.C. 1984. *Not in Our Genes: Biology, Ideology and Human Nature*. Harmondsworth: Penguin.
- Scheper-Hughes, N. and Wacquant, L.J.D. 2002. *Commodifying Bodies*. London: Sage Publications Ltd.
- Shiva, V. 1997. *Biopiracy: The Plunder of Nature and Knowledge*. Boston, Mass: South End Press.
- Sunder Rajan, K. 2006. *Biocapital: The Constitution of Postgenomic Life*. Durham, N.C.: Duke University Press.
- Thompson, C. 2005. *Making Parents: The Ontological Choreography of Reproductive Technologies*. Cambridge, Mass: MIT Press.
- Vrecko, S. 2006. Folk neurology and the remaking of identity. *Molecular Interventions*, 6(6), 300–3.
- Waldby, C. 2002. Stem cells, tissue cultures and the production of biovalue. *Health: An Interdisciplinary Journal for the Social Study of Health, Illness and Medicine*, 6(3), 305–23.

- Waldby, C. and Mitchell, R. 2006. *Tissue Economies: Blood, Organs, and Cell Lines in Late Capitalism*. Durham, N.C.: Duke University Press.
- World Transhumanist Association 2002. *The Transhumanist Declaration*. [Online]. Available at: <http://www.transhumanism.org/index.php/WTA/declaration/> [accessed on 18 February 2009].