

## Book review

### **Nature After the Genome** **Sarah Parry and John Dupré (eds.)** **Oxford: Blackwell Publishing, 2011**

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This volume comprises 10 essays that draw on the diverse set of meanings of genomes. Since genomic science covers a wide range of activities, it is hard to say unambiguously what genomics is. In the introductory chapter, Sarah Parry and John Dupré argue that a lot of confusion is created by the fact that there are two different ways to think about the genome: either in an abstract way, namely as a body of *information*, or as a *material* thing. A second reason why genomics is surrounded by confusion is that this concept is not always construed narrowly, but is sometimes used to refer to a broad range of contemporary biomolecular investigations.

As indicated by the title, this book is not only about genomics. Parry and Dupré are interested in the ways in which the issue of nature is significant in relation to genomics. They argue that, since genomics places biology, and consequently nature, centre stage, “genomics provides new knowledge and understandings of the natural and social worlds” (p.6). Besides studying the biological world, however, genomics “also involves producing that world both symbolically and materially” (p.6). Consequently, genomics also *changes* the relationship between the natural and social worlds. The phrase ‘after the genome’ might create the impression that Parry and Dupré understand genomics as a finished event. The editors claim however, that genomics “is at its beginning rather than a thing of the past” (p.4), so with that phrase, they refer to the ways in which (our understanding of) nature is reshaped by developments in genomics science.

After the introduction the book is divided into five parts, each reflecting a different theme. Each theme is tackled in two essays by different authors with backgrounds in the social sciences or the humanities. In the first, the pair of authors critically assesses the ways in which biological entities are classified. In ‘The polygenomic organism’, John Dupré challenges the assumption that genomes stand in one-to-one relations with organisms. With the aid of different examples – clones, chimerism, mosaicism, epigenetics/epigenomics – he aims to show that the boundaries of biological individuals cannot be demarcated by reference to their genotypes. With his final example, symbiosis and metaorganisms, Dupré makes a more radical suggestion: “[T]here are good reasons to deny the almost universal assumption that all the cells in an individual must belong to the same species” (p.27). He illustrates this by pointing to the fact that about 90 per cent of the cells in our body belong to microbial symbionts. These symbionts are essential for its proper functioning. By proving the invalidity of the assumption of one genome, one organism, and by showing that “biological entities consist of disparate elements working together” (p.29), Dupré invites us to rethink the (natural) boundaries of biological objects. What’s more, he encourages us to consider how this questioning of our traditional ordering systems

affects the ethical, social, and legal distinctions of the 'individual'. Nicola Marks further reflects on our dominant classification systems. She discusses the epistemological, ontological and socio-political implications of classifying stem cells – and by extension nature – according to particular criteria. Marks argues that the classification of stem cells into specific groups (e.g. 'adult', 'foetal' and 'embryonic') reflects not only the material characteristics of the entities in question, but also the goals and interests of those doing the classifying. Hence, classifications must be understood "as socially sustained 'institutions' underpinned by knowledge that is itself inherently social" (p.33).

The next two chapters explore how genomics is reconfiguring the gene/environment, or nature/nurture relationship. Gail Davies critically assesses the extent to which animal experiments in behavioural neuroscience could help us to understand human behaviour. Following Evelyn Fox Keller, Davies argues that "ideas about nature as separate from nurture endure in the models, metaphors, drugs and devices used in experimental practices and scientific claims, particularly in the study of behavioural genetics" (p.56). In contemporary experiments, this nature/nurture distinction is generally rearticulated as a duality between genes and environment. Davies explains that this reductionist approach undermines the importance of social, historical, environmental or other experiential elements to an animal's behaviour. Reflecting on the philosophical thought of Giorgio Agamben, she aims to replace reductionist explanations of species' behaviour with more relational "accounts and experimental practices that recognize and allocate agency in creatively open ways" (p.67). Karen Throsby and Celia Roberts also discuss the limitations of the gene-environment distinction, but by focusing on two rather different case studies: precocious puberty and childhood obesity. In biomedical discourses, both conditions are explained according to genetic predisposition in interaction with environments. Throsby and Roberts are especially interested in the aetiological and moral complexities that are left out in such reductionist explanations: "What new questions can be asked, and new kinds of interventions [...] imagined, if the gene-environment distinction is refused?" (p.74). In line with Davies, Throsby and Roberts argue that to make effective interventions in the cases of early puberty and childhood obesity, we must think about bodies in relational terms. Inspired by Anne Fausto-Sterling, they claim that we must refuse a separation between genes and environments, and instead think of ourselves as "always 100 percent nature and 100 percent nurture" (p.88).

The third pair of authors focuses on the creation of new kinds of objects in genomics-related research. Jane Calvert examines the ways in which synthetic biology is (re)constructing nature. Synthetic biology is a new field of science capable of producing completely novel biological entities. By blurring the boundaries between the natural and the artificial, the field challenges our notions of what is 'natural'. Calvert explains that pressures for engineerability, commodification and standardisation are all pulling towards a reconstruction of nature which is instrumentalizable and utilisable for our purposes. She expects these pressures to have profound consequences for the kinds of living things that will be brought into the world in the future. Calvert nevertheless concludes that our desire to control nature may be hampered by nature's apparent unruliness. She argues that "it will be fascinating to see [...] what limitations the exuberance of nature will impose on the

scientists and engineers' desire for control" (p.109). Sarah Parry examines "how ideas of animal and human nature are figured in the case of interspecies entities" (p.125). She wants to explore "the material and discursive implications of these inscriptions" (p.125). Like the entities created by synthetic biologists, interspecies – e.g. animal-human embryos – can only come into being through technoscientific intervention in laboratory practices. Drawing on transcripts of the debate at a specific public event, Parry analyses how classification of interspecies leads to the prioritisation of certain features at the expense of other characteristics.

The next two chapters examine how genomics transforms plant life. Richard Milne explores the future of biopharming, the production of pharmaceuticals using genetically modified crops. Conventional food crops are considered ideal for biopharming. Using edible crops for pharmaceutical purposes, however, raises questions about the material and symbolic boundaries of food. Drawing on data derived from expert and public discussions, Milne shows how "the same materiality [i.e. maize] can come to embody both hopes and fears around new technologies as the complexities around it multiply" (p.148). Claire Waterton critically examines 'DNA barcoding', a recent innovation within the discipline of taxonomy. In pro-barcoding literature, this genomic technology is generally presented as "the key that [will] unlock the secrets of the diversity of life" (p.157). Waterton argues that the vision of barcoding as a new global taxonomic system should be questioned. Drawing on interviews with practising taxonomists, she shows how debates about nature and culture, and the natural and the social, seriously affect the ways in which we order and classify the natural world.

Compared to the previous chapters, the final two chapters have quite a broad focus, discussing how developments in genomics increasingly affect theories of nature. Richard Twine analyses how 'nature' is conceptualised in genomics by examining the distinction between transhumanism and critical posthumanism. Whereas transhumanism and critical posthumanism have some aspects in common, the former generally sticks to the Enlightenment's dualistic understandings of 'nature'. Posthumanism, on the other hand, tries to unravel dualistic ontology; it criticises transhumanism for its failure "to engage critically with the constellation of dualistic ontology which has fuelled humanism's capacity for exclusion and othering" (p.183). With the aid of two examples – the use of hybrid embryos in stem cell research and the use of interspecies databases in farm animal comparative genomics – Twine shows that genomics frames nature in ways that are faithful to transhumanist values. At the same time, however, genomics undermines Enlightenment conceptions of nature, for instance by showing the ways in which laboratory animals are 'humanised' for comparative studies, and how we use animal models to find cures for human diseases. As such, genomics also encourages us to think beyond dualistic categories of human/animal and nature/culture. In 'Life Times', Tim Newton argues that many contemporaries consider dualism to be responsible for many of the ills of knowledge construction since the Enlightenment. The desire to break down dualistic barriers, however, involves the danger of denying the possibility of differences in our perception of temporality across physical, biological and social spheres. Newton finds the assumption that 'social' and 'biological' time are 'one' in a diversity of contemporary fields, for example in the images of temporality engendered by a central

concept of molecular anthropology: the ‘molecular clock’. Newton concludes by arguing that “even though human beings constitute a social and biochemical ‘unity of substance’ [...], this does not mean that we perceive temporality across the domains of nature in exactly the same way” (p.211).

Because of its interdisciplinary focus, *Nature after the Genome* provides intriguing information for quite a broad audience. By bringing together empirical material and philosophical reflections, this volume is not only interesting for readers from the social sciences and the humanities, but also for scientists working in the field of genomics. By showing how genomic science “is situated as a social activity in a much wider social and political context” (p.9), the book encourages genomic scientists to reflect on the ways in which nature is reshaped by developments in this field. As each chapter can also be read as a standalone essay, the book contains relevant information for readers with more specific interests as well (e.g. synthetic biology, biopharming).

Notwithstanding that *Nature after the Genome* brings together a wide range of perspectives and conceptual views, Parry and Dupré do succeed in merging these various contributions into a unity. Overall, of course, all contributions reflect on the same central theme, namely the ways in which developments in genomics question our dominant systems of ordering and classifying nature/biological life. What is more, the essays to a large extent reflect on the same literature. The writings of Evelyn Fox Keller, in particular, appear time and again as an important source of inspiration. The book concludes with two essays with a rather broad focus. Although it seems reasonable to close with a more general reflection, arguably, the book could equally have started with the contributions by Twine and Newton; their considerations would have been helpful in reflecting on the issues raised in the other chapters.

In reflecting on the ways in which nature is reshaped by developments in genomic science, the contributors to this book mainly focus on ontological and epistemological questions. Much less attention is given to the moral implications of these developments. The essays in this volume show that genomics practices continually undermine traditional classification systems. By reshaping the epistemology and ontology of nature, genomics opens up pathways to a new morality. There is ample material in this volume to justify a more in-depth discussion of this. Questions concerning the (natural) boundaries of biological objects, individual responsibility, and the refitting of scientific uncertainties into familiar reductionist schemes, are raised but could have been discussed a little bit further. Little attention is paid to the political and economic powers that favour certain representations and promissory narratives over others. Genomics provides us with the tools and knowledge to distrust Enlightenment conceptions of nature. The editors could have offered a new perspective of what nature *could* look like after genomics. Although this volume encourages us to reflect on these matters, the book could have given us firmer directions for this reflection.

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