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Essay review

Heredity reconceived?

Staffan Müller-Wille and Hans-Jörg Rheinberger (eds.), *Heredity Produced: At the Crossroads of Biology, Politics and Culture, 1500–1870*. Cambridge, MA and London: MIT Press, 2007. Pp. x + 496. ISBN 978-0-262-13476-7. £30.95 (hardback).
Phillip Thurtle, *The Emergence of Genetic Rationality: Space, Time, and Information in American Biological Science, 1870–1920*. Seattle and London: Washington University Press, 2007. Pp. xiii + 381. ISBN 978-0-295-98750-7. £16.99 (paperback).

As in other areas of the history of science, the earliest books on the history of genetics were written by the geneticists themselves. One thinks, for example, of L.C. Dunn, Hans Stubbe or François Jacob. From the 1970s, historians began to enter the field, but it still remained largely the preserve of those with biological training (Garland Allen, Robert Olby, Nils Roll-Hansen *et al.*). Since then, the arrival of practitioners from a wider range of backgrounds has helped to strengthen work in the social and institutional history of genetics. And in the last few years, attempts to develop a cultural history of the field have begun to appear, written by historians who have drawn heavily upon disciplines other than history, or who come from outside the history of science altogether. In what follows I want to explore the extent to which two recent books of this kind may be providing new perspectives on familiar material as well as posing new questions.

The volume edited by Staffan Müller-Wille and Hans-Jörg Rheinberger emerges out of a research programme in the 'cultural history of heredity' conceived by Rheinberger at the Max Planck Institute for the History of Science in Berlin. Since 2001 he and Müller-Wille have organized a series of international workshops at which speakers from diverse disciplines have examined the emergence and transformation of concepts and practices of 'heredity' (in the broadest sense) since the sixteenth century. The focus of *Heredity Produced*, the first of several planned volumes, is not on genetics as a discipline or even as a body of knowledge, but rather on an older and highly diverse cluster of ways of thinking about – and working on – heritable phenomena, the convergence of which around 1800 made possible what later became known as 'genetics'.

Until the end of the eighteenth century, patterns of similarity between parents and offspring – such as facial features or diseases characteristic of a particular family – were certainly noticed, but they were seen as the results of contingency. Similar traits were thought to arise because of the similar circumstances in which individuals were conceived and/or developed; inheritance was not understood as a process distinct from generation,

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nor as encompassing both similarity and difference. Before 1800, to be sure, there were several domains where investigators were studying phenomena in the organic realm which would later be classed as 'hereditary' – medicine, studies of human variation, natural history and breeding – but these studies proceeded largely in isolation from one another. Interestingly, the editors have chosen not to group the essays by chronology, presumably because this might have encouraged a conventional linear or developmental view of the emergence of 'heredity'. Instead they are grouped by cultural domain: there are sections devoted to law, medicine, breeding and natural history, generation and evolution, and anthropology. The advantage of this arrangement is that the reader gains a strong sense of the independent and distinctive discourses in various domains and thus a better appreciation of the key historiographical task: to understand how and why these discourses eventually converged (or at least impinged) on one another.

Although not all of the sections in the book are particularly successful in demonstrating the contribution of their cultural domain to the emergence of a general concept of heredity, one context which clearly was important was the medical one. In a nice essay Carlos López-Beltrán shows how among French physicians early modern views of the circumstantial causes of hereditary disease had given way by the end of the eighteenth century to a conception of internal causes, applying not only to human disease but also to morphological traits. Consequently, by the 1830s the term *hérédité* (as well as its counterparts in several European languages) was being used in its modern sense. The process was driven, López-Beltrán suggests, by the decline in humoralist theories of the body (which had allocated a large role to environmental factors in the causation of disease), by changing standards of proof in medical argument and by attempts by the medical profession to lay claim to greater authority in the arena of public health.

López-Beltrán goes so far as to claim that 'the conceptual space in which naturalists framed their preoccupations concerning hereditary transmission of physical features [from the early nineteenth century] was a space carved out by medical men in the first instance' (p. 107), though he does not argue the point. He might be right, but Roger Wood's essay, on the other hand, suggests that animal breeders followed an independent route towards the general study of inheritance around 1800, driven by the practical problems they faced. Sheep breeders such as Robert Bakewell, for example, were obliged to establish the fact that certain properties of parent animals were regularly transmitted to offspring; had he not been able to demonstrate this, he could not have persuaded farmers to rent his highly bred rams. Moreover, the fact that he thought about such transmission in terms of individual traits was a natural consequence of the fact that some features of the sheep were much more highly valued in the marketplace than others. Along the way Wood offers an instructive example of the convergence of cultural domains; we learn that the aim behind the establishment of a Sheep Breeding Association in early nineteenth-century Moravia was to bring together naturalists and breeders in a common search for general answers to questions of inheritance. The case reminds us how important it will be in future work to establish just what kinds of communication, as well as conceptual borrowing, may have taken place among the various cultural domains.

But what might have led to 'convergence' in the first place? In a helpful introductory essay the editors outline two such causes which are of particular interest. One of them

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concerns what I would call 'boundary-crossing'. As they note, until well into the nineteenth century, there were 'strong institutional and social obstacles to a unified view of heredity' (p. 20), so that the erosion of such barriers was important in making convergence easier. Sometimes the boundaries crossed were geographical ones, as when species from abroad were brought to European botanical gardens, or were imported by breeders, or when human populations were shifted around through colonialism. And in moving organisms to new environments, observers were confronted with the fact that some characteristic traits faded while others persisted. In other cases the boundaries crossed were those of social role. In an illuminating essay, Marc Ratcliff shows how a French botanist chose to work on the derivation of strawberry varieties – a highly unusual move for a botanist at that time because of horticulture's lower status. Through such trespassing, however, he became aware that, although many varieties of strawberry were unstable, others remained constant. Since the latter fact was then anomalous within botany, he sought to explain it by charting the sequence of steps taken by breeders over time, presenting his results in the (heretofore novel) form of a genealogy. Ratcliff's study thus enables us to ask whether certain newly emerging conditions around the year 1800 may have made it easier to bridge the gap between 'science' and breeding.

The second cause, as Müller-Wille and Rheinberger remark in passing, is that 'capitalism and bourgeois culture certainly facilitated' the process of convergence (p. 25). While a few of the essays touch upon this issue, however, it is nowhere systematically explored. Laure Cartron's study of degeneration in early nineteenth-century France, for example, observes that the idea that mental disease was heritable was especially strong among the bourgeoisie, who were inclined to see 'good heredity' as more important than ancestry or pedigree. Similarly, Philip Wilson shows that Erasmus Darwin's writings on hereditary disease were rooted in an ideology of self-help as well as in a critique of aristocratic marriage patterns. Another promising site for this kind of analysis is Ohad Parnes's interesting discussion of nineteenth-century theories of inheritance. He argues that the emergence of the modern notion of heredity in the later nineteenth century was made possible by an 'epistemological shift' early in the century, namely an increasing tendency to make sense of the individual organism by placing it in a sequence of 'generations' (such as in the study of 'alternating generations'). In so doing, biologists were prompted to think about both continuity and change across generations. The shift also took place, as Parnes shows, in the analysis of social change: early nineteenth-century thinkers, including Comte and Marx, were conceptualizing that process in terms of generational change. Quite why both life scientists and analysts of society began to think in generational terms at this time is not addressed, but the obvious candidate would seem to be the revolutions of the late eighteenth century. Just as boundary-crossing prompts trespassers to make sense of the differences they confront, those experiencing social dislocation are more likely to reflect upon the causes of continuity and change in the social order (and, via metaphorical extension, in the natural order).

Anyone who has edited a collection knows that it is not always easy to get contributors to address the volume's overarching theme. The challenge is especially large with a syncretic project like this one which requires specialists to look (or think) beyond the confines of the territory familiar to them. Unsurprisingly, therefore, several of the

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authors here make little attempt to relate their material to the emergence of heredity. That said, *Heredity Produced* is an admirably ambitious book which opens up new historiographical terrain and ought to inspire a good deal of future work.

Phillip Thurtle's *The Emergence of Genetic Rationality* is also a cultural history of heredity. Although Thurtle's doctorate was in history and philosophy of science, he borrows tools drawn from a wide range of sources including intellectual history, cultural theory, media theory and continental philosophy, as well as science and technology studies. (The fourth section of the book is entitled 'The poetics of wandering: time, narrative and the affective/phenomenological body'.) In other respects, however, *Emergence* is a very different kind of book. While *Heredity Produced* is concerned with the early nineteenth-century coming-into-being of the idea that heredity is a general phenomenon, *Emergence* focuses upon the late nineteenth-century formation of a very particular way of analysing and representing heredity. Moreover, while most of the authors in the edited collection are more concerned with 'how?' than with 'why?', for Thurtle explanation is all-important. And if capitalism plays a rather marginal role in *Heredity Produced*, it is at the very centre of *Emergence*. Thurtle's thesis is that with the late nineteenth-century shift from mercantile to industrial capitalism, businessmen adopted new forms of information-processing and management structure in order to cope with a flood of new information. And both of these innovations were taken up in turn-of-the-century analyses of heredity, whether plant, animal or human.

So what is 'genetic rationality'? Thurtle defines it as the use of experiment, the analysis of heritable patterns in large populations, and the use of a simple symbolism to make sense of patterns of transmission. Both the term and the definition would seem to point unambiguously towards the new Mendelian genetics from 1900, but surprisingly there is in fact very little discussion in the book of early Mendelism. (Although the work of Hugo De Vries is discussed, for example, the focus is on his theory of evolution rather than on his Mendelism). What is dealt with in much greater detail is late nineteenth-century animal breeding, plant breeding and eugenics, all of which are said to display a specific aspect of genetic rationality, though none of them meets all of Thurtle's criteria. If he intended 'genetic rationality' as an ideal type, he does not say so.

In the book's third section, the subject matter drifts yet further from Mendelism, and one begins to wonder precisely what it is that the book seeks to explain. Now the contrast Thurtle sets up is between nineteenth-century 'developmentalist' theories of evolution (for example, Haeckel's recapitulationism) and the saltationist approaches to evolution favoured by De Vries and other laboratory biologists around 1900. At issue are their different modes of perception as well as the different ways in which they assemble evidence into an interpretative account. If, however, Thurtle's aim here is to treat the emergence of 'genetic rationality' as a special case of the rise of laboratory biology, various difficulties arise. Although the contrasts drawn – between natural history and experiment, between field and laboratory – are certainly interesting and important, he seems to have bought into an earlier account of this 'revolution' in the life sciences without looking carefully at the nineteenth-century research traditions and breeding practices which preceded it. Had he done so, he might have been more cautious about portraying the turn of the century as a watershed. For example, the claim that the

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detailed pedigrees assembled in the late nineteenth century by both plant breeders and eugenists reflected new ways of processing information appears at odds with the fact that the construction of pedigrees was not new in the late nineteenth century. It can be found in plant breeding around mid-century and in animal breeding even earlier. In addition, the claim that the practices of late nineteenth-century horse breeders incorporated several features of the new managerial capitalism might be more convincing if Thurtle had shown that they differed from the earlier methods devised by Robert Bakewell or other successful nineteenth-century breeders (unfortunately several important monographs on animal breeding seem not to have been consulted). Similarly, Thurtle sees De Vries's mutation theory as embodying the new 'genetic rationality' of the late nineteenth century, even though similar saltationist theories of evolution can be found a generation earlier. The same problem arises with the book's claim that the distinction between variance due to environment and that due to heredity was made possible by 'new' late nineteenth-century developments; this ignores the fact that a similar distinction was commonplace among breeders much earlier. Or consider another claim, that the late nineteenth-century decline of natural history was due to the emergence of 'extensive data sets' generated by new techniques of information-processing. If so, what are we to make of the enormous amounts of data which were gathered in eighteenth- and nineteenth-century voyages of discovery and processed by an earlier generation of naturalists such as Humboldt or Darwin? Were these not 'data sets'? In short, if many of the practices and concepts which Thurtle regards as novel in the late nineteenth century are in fact a good deal older, what explanatory significance can be assigned to the rise of managerial capitalism?

Lastly, at one point the book's interpretation seems to ignore rather elementary differences between science and technology. In Chapter 13 Thurtle wants to show how the new 'genetic rationality' emerged in breeding practices around the turn of the century. He does so by contrasting the idiosyncratic and erratic record-keeping of the plant breeder Luther Burbank (whom he regards as semi-modern in outlook) with the newer methods advocated by the Mendelian geneticist G.H. Shull. But this is to compare chalk and cheese. For one thing, Burbank's aim was to develop commercially successful new plant types, not a conceptual scheme for interpreting variation among them. For another, this contrast takes no account of the fact that Burbank was a private breeder whose records did not have to make sense to others (and may well have been kept secret from other breeders), while Shull was a member of a scholarly community which was entitled to demand access to his records. That the practices of a commercial inventor were radically different from those of an academic scientist is thus hardly surprising, and certainly cannot be cited as evidence for the emergence of a new kind of rationality.

Given the book's broad scope and ambition, Thurtle is quite right to claim that it represents 'a new way of conceiving the history of genetics' (p. 24). On the other hand, its attempt to trace the effects of wider cultural movements upon particular developments in genetics is not new, and it is odd that he makes no mention of important earlier work by William Coleman, Donald MacKenzie, Mark Adams and others. Perhaps this omission is symptomatic of the kind of book this is. For judging from the amount of

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space Thurtle devotes to various topics, it seems clear that he is rather more interested in historical changes in forms of communication, narrative and perception than he is in innovation in the life sciences. As a result, the connections which he tries to make between context and science are not always clear or persuasive. Nevertheless, he should be congratulated for daring to take on a huge and important task, and I hope that the book's existence will now encourage others to have a go.

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