('The Externalised retina: selection and mathematization in the visual documentation of objects in the life sciences', in M. Lynch and S. Woolgar (eds.), *Representation in Scientific Practice* (1990), pp. 153–186).

Last, but not least, this book creates a renewed ground for reflection on the relation between mathematics as a form of knowledge and the physical world, a long-standing but always thought-provoking philosophical theme. For the promoters of the transformation towards diagrammatic (mathematically and device-dependent) knowledge the expectation was and still is that these expressions could not only reveal nature's otherwise concealed secrets, but also provide ways for its manipulation. Regardless of particular cases of success or failure in achieving these aims, what the culture of diagram has brought about is the idea of a reality that is co-constructed (even modified in Bohr's view) by the interaction between the world and a viewer equipped with a 'sensorium', which is enhanced, so the story goes, by the combined use of mathematics and registering devices.

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B. Ricardo Brown, **Until Darwin: Science, Human Variety and the Origin of Race**. London: Pickering & Chatto, 2010. Pp. ix + 199. ISBN 978-1-84893-100-8. £60.00 (hardback).
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Scholars have investigated the concept of race and the science of race from a variety of perspectives. Historians of anthropology have traced the role of race in anthropological research and theory. Historians of biology have examined the relationships between the taxonomic definitions of species and variety and the problem of human racial variation, as well as evolutionary and non-evolutionary theories of how human variation arose. Social historians have analysed the political and social implications of ideas about race. Ricardo Brown's book explores the complex web of social, political, and scientific factors that contributed to the identification of human variation in the eighteenth and nineteenth centuries as an important problem that needed to be investigated and explained. It begins with the claim that the existence of variety in living organisms, and especially the discovery of an unexpected diversity of human types by Europeans as a result of the voyages of exploration, was at the heart of the species question that dominated natural history from the seventeenth to the nineteenth centuries.

Brown describes the classification systems proposed by Linnaeus, Buffon and Blumenbach in the eighteenth century, noting their significance in shaping anthropological attitudes about human diversity. Linnaeus not only created the order of Primates, but he also identified several distinct races of *Homo sapiens* as well as distinguishing a second human species that he called *Homo nocturnus*. Brown notes the importance given to monogenism – the notion that all humans belong to one species and share a common origin – in the works of Buffon and Blumenbach. But he does not adequately address the critical issue of the theories proposed particularly by Buffon to account for racial variation among humans, nor does he cite Philip Sloan's scholarship on this subject. Using the example of Cuvier, Brown links the problem of the origin of human variation to the question of species change and the widespread resistance to any theory of transmutation prior to Darwin. But the evidence employed to investigate this problem is very narrow and does not do justice to the number of different opinions and approaches to this problem at the turn of the nineteenth century.

One chapter is dedicated to the debate in the nineteenth century between polygenists, who believed human races had separate origins (and in some cases believed they were separate species), and monogenists, who believed all humans had a single origin and belonged to one species. Brown focuses on those American researchers, such as Samuel Morton, George Gliddon and Josiah Nott, who did so much to advocate the polygenist cause. Historians of anthropology have written a great

deal about this group and Brown introduces little new information. He also describes the contributions of the Swiss naturalist Louis Agassiz, who became involved in this debate after his arrival in the United States. Yet there is little discussion of the significant contingent of polygenist anthropologists in Britain who composed the majority of members of the Anthropological Society of London, and there is no mention at all of the French polygenists who belonged to the Société d'anthropologie de Paris. Brown's argument would have been much stronger had he examined the broader range of polygenist beliefs and the range of monogenist reaction to it. We would also have gained a much fuller picture of the polygenism–monogenism debate and its relationship to advances in philology, the geological evidence for the antiquity of humans, and the biological question of species and variation.

The broader goal of Brown's book is not simply to trace the history of anthropological and biological thought about human variation and the problem of race, but to locate these questions within the social and political context of nineteenth-century racism and the institution of slavery. Again, there is a substantial scholarly literature on these latter issues and therefore the challenge for Brown is to link the scientific components of this topic to these social and political elements in a way that gives us a novel understanding of these subjects. He does offer interesting analyses of American anthropologists' contributions to the debate over slavery and the ways in which Darwin's theory of human evolution and its reassertion of monogenism affected nineteenth-century society's conception of race and human diversity. There is a lengthy discussion of Darwin's private views about slavery as well as Darwin's own experience of the institution in South America during the HMS *Beagle* voyage, which has also been the subject of extensive recent scholarship. Brown devotes considerable time, in this context, to discussing Darwin's studies of 'slavery' among ants in an effort to further illuminate Darwin's thinking about the biological nature of slavery. Brown asserts that the adoption of Darwin's theory of evolution created a modified form of monogenism and a novel explanation for the origin of racial variation in humans. While this is certainly true, there is little evidence from late nineteenth- or early twentieth-century anthropology to illustrate this claim. Historians of anthropology and palaeoanthropology have noted that the acceptance of the idea of human evolution and common descent did not spell the demise of polygenism but instead replaced the original polygenist idea of separate origins with polytypic theories for the evolution of the different human races that continued to emphasize their separateness and distinctness.

Brown has tackled a complex subject with tools that could lead to valuable new insights. Social historians may gain some insights into the ways scientific theories and problems helped to inform ideas about race in the nineteenth century, but the result will probably be disappointing for historians of science. Nevertheless, Brown has identified a set of problems and relationships connecting natural history, anthropology, race theory and slavery that may prompt future researchers to pursue avenues not yet fully explored.

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DAVID N. LIVINGSTONE and CHARLES W.J. WITHERS (eds.), **Geographies of Nineteenth-Century Science**. London and Chicago: The University of Chicago Press, 2011. Pp. x + 526. ISBN 978-0-226-48726-7. £35.50 (hardback)
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This homogeneous and well-structured collection of essays explores geographies of nineteenth-century science in Britain with the occasional offshoot to British colonies and beyond. As a whole the volume represents an important contribution to a flourishing field in the history of science that the two editors of this collection over the last two decades have done much to develop and influence. In line with the bulk of this scholarship, the articles in the volume are primarily informed