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EZIO VAILATI, *Leibniz and Clarke. A Study of Their Correspondence*. Oxford and New York: Oxford University Press/OUP USA, 1997. Pp. xii + 250. ISBN 0-19-5113993. £35.00.

The correspondence between Leibniz and Samuel Clarke constitutes some of the most notable documents of early eighteenth-century philosophy. Provoked into intellectual assault, in 1715–16 Leibniz launched a searching critique of Newton's natural philosophy and its theological underpinning. Clarke, a philosopher, theologian and Newtonian stalwart, no stranger to con-

troversy, took up the defence of Newton. For this reason the correspondence has been of special interest to historians of science, and the debate between the protagonists over the nature of space and time still fuels discussion among philosophers.

In 1962 Koyré and Cohen published an article, publicizing contemporary Newton manuscripts which bore directly on the themes of the correspondence between Leibniz and Clarke. Most historical accounts of the correspondence tend to see Clarke as a puppet, with Newton manipulating the strings behind the scenes, as he was wont to do on other occasions. But a note of caution about Newton's role has been sounded by Rupert Hall, and it is indeed the case that there are no extant letters between Newton and Clarke bearing on Clarke's correspondence with Leibniz. This may not in itself be surprising, but in his lucidly argued commentary on the correspondence Ezio Vailati gives Clarke his full due. Noting that most of Clarke's arguments adduced against Leibniz had already been deployed in his Boyle Lectures of 1705–6, in other philosophical debates and in his sermons, Vailati takes the correspondence as a direct confrontation between Leibniz and Clarke.

There have been several editions of the correspondence, and there is a large literature concerned with elements of the debate and its historical context, but Vailati's study is the first comprehensive commentary on the correspondence as a whole. His argument is shaped by a probing philosophical enquiry which is also thoroughly historical. He carefully examines the themes of God's relation to nature, the problem of free will, the nature of space and time, the problems of matter, force and the Newtonian theory of gravity, and the relation between miracles and natural philosophy, which thread their way through the correspondence. As the debate proceeded, the arguments became ever more minute, but Vailati succeeds in keeping his discussion fresh.

Vailati is fully familiar with the literature, primary and secondary, and he deploys the secondary literature critically and to good effect. While I found that I did not always completely agree with his judgements, they are always soundly based on a close reading of the texts. It may well be that some of the issues in natural philosophy, such as the problems of 'force' and *vis viva*, of special interest to historians of science, could have been given more extensive treatment. Nevertheless, as a searching study of the Leibniz–Clarke correspondence of Newtonian and Leibnizian natural philosophy, this book is a valuable contribution to the history of science.

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ERIC G. FORBES, LESLEY MURDIN and FRANCES WILLMOTH (eds.), **The Correspondence of John Flamsteed, the First Astronomer Royal. Vol. 1. 1666–1682.** Bristol: Institute of Physics, 1995. Pp. xlix+955. ISBN 0-7503-01473-3. £140.00, \$280.00. ERIC G. FORBES, LESLEY MURDIN and FRANCES WILLMOTH (eds.), **The Correspondence of John Flamsteed, the First Astronomer Royal. Vol. 2. 1682–1703.** Bristol: Institute of Physics, 1997. Pp. xxxvii-1095. ISBN 0-7503-0391-3. £140.00, \$280.00.

The first two of three projected volumes of the collected correspondence of John Flamsteed are valuable resources for the history of astronomy that were undertaken in difficult circumstances. Although the project was begun by Eric Forbes, it was interrupted by his early death in 1984. Editorial responsibilities were taken over at first by Lesley Murdin and then by Frances Willmoth; it is Willmoth who is primarily responsible for the remarkable achievement these volumes represent.

Volume 1 covers the first 450 letters, Flamsteed's correspondence from 1666 to 1682. Some of the letters have appeared in the published correspondence of Newton and Oldenburg, in Francis Baily's *Account of the Revd. John Flamsteed*, or elsewhere, but these letters have been checked against surviving originals and new translations have been prepared for the letters written in Latin. Most of the

letters, however, are published here for the first time, and where a letter is not written in English, an English translation is provided in addition to the original letter. The volume's value is enhanced by an excellent glossary of technical terms, useful bibliographical notes and an index. Additionally, there is an appendix of relevant official documents, and Willmoth has written an excellent introduction.

Among Flamsteed's correspondents in this period were John Collins, Jonas Moore and Henry Oldenburg. Other figures whose letters are notable in this volume are Halley, Hevelius, Molyneux and Newton. This volume deals with, for example, the origins of the Royal Observatory and Flamsteed's disagreement with Hevelius on the use of telescopic sights for astronomical measurements. Scholars who are concerned with such topics as mathematical education and the relationship between astronomy and new navigational techniques will be delighted by the correspondence with the Governors of Christ's Hospital concerning the duties of the master of the mathematical school. Flamsteed's scheme for the instruction of the forty boys of the Royal Mathematical School shows a great concern that the Master 'take speciall Care to shew the youth the Errors of our Common Seamen in their way of Reckoning, and to Caution them against the like'. Interestingly, although Flamsteed favoured practical observation over theoretical astronomy he was at the same time a strong proponent of the importance of theory versus practice in mathematical education. Towards the end of the volume Flamsteed is concerned about his future due to the deaths of his patron, Jonas Moore, and Charles II. Volume II allows us to pick up the story again at a crucial moment.

Volume II covers the next 450 letters, the correspondence between 1682 and 1703. This volume also includes the glossary of technical terms, bibliographical notes, and index, as well as another fine introduction by Willmoth. The first part of the volume is dominated by Flamsteed's correspondence with an Irish mathematician, William Molyneux. The topics of discussion range from optics and tides to Newton's *Principia*. The correspondence breaks off abruptly when Molyneux displeases Flamsteed, perhaps by not giving Flamsteed any

credit in his book on optics, or because Flamsteed's rival Edmond Halley had assisted Molyneux with its publication.

Once again, this volume provides insights into Flamsteed's view of the indebtedness of navigation to astronomy in the form of a letter to Samuel Pepys. Here Flamsteed claims that a history of navigation and one of astronomy should be basically identical. The letter was written to support a particular view of the type of Master needed for the Royal Mathematical School as well as to support a theoretically based curriculum. On these topics, if nowhere else, Flamsteed and Newton were in complete agreement.

This volume also includes the correspondence with Newton that is for the most part already available in Volumes 2–4 of *The Correspondence Of Isaac Newton*. The advantage of reading this version is that the letters are placed in the context of Flamsteed's life and work. It is fascinating how the tone of Flamsteed's letters changes over time from writing to Newton that he was 'heartily glad that my communications are usefull to you and I intreat you whenever you think that any thinge in my power may serve you, you may freely commanded it' to 'I have just cause to complaine of the stile and expressions of your last letter, they are not friendly.' These letters provide an exciting view of eighteenth-century scientific politics, and highlight the manoeuvring around the publication of Flamsteed's star catalogue. We should look forward to the third and final volume of this valuable series where we will learn of the conclusion of these conflicts, and the tale of how the star catalogue was finally printed.

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FRANCES WILLMOTH (ed.), *Flamsteed's Stars: New Perspectives on the Life and Work of the first Astronomer Royal, 1646–1719*. Woodbridge, Suffolk: The Boydell Press in association with the National Maritime Museum, 1997. Pp. xiv + 271. ISBN 0-85115-706-8. £45.00.

This collection stems from a conference at the National Maritime Museum celebrating the

publication of Volume 1 of John Flamsteed's *Correspondence*, where versions of many of the twelve articles were presented. It also contains both an introduction and a summary catalogue of Flamsteed's papers in the Royal Greenwich Observatory Archives by the editor, Frances Willmoth. This edition provides an illuminating demonstration of the value of the publication of Flamsteed's *Correspondence* not only to scholarship centred on Flamsteed but also to works concerned with the general practice of astronomy around 1700.

Several of the articles share a common theme: Flamsteed's invention of the new role of national astronomical observer and his concern with his own public image. Jim Bennett's fascinating overview of Flamsteed's career, for instance, describes the 'practical and moral imperatives' that led Flamsteed to view astronomy's importance in its accurate observations instead of its contributions to natural philosophy. Using Robert Westman's seminal paper 'The astronomer's role in the sixteenth century' as a benchmark, Bennett traces the developments in instrumentation, institutions and patronage that led to Flamsteed's vision becoming increasingly unpopular. Editor Frances Willmoth's article concentrates on early models for Flamsteed's style of astronomy, such as the work of Jeremiah Horrocks and his associates William Crabtree and William Gascoigne. Interestingly, she demonstrates how the value of Horrocks's model of 'Protestant, non-astrological, predication-calculating' astronomy lessened for Flamsteed after the Observatory's foundation. Instead, Tycho Brahe became a more appropriate model. Adrian Johns also contributes to the theme of creation of self-image and public image with an article that demonstrates how Flamsteed's debates concerning the nature of light illuminate his conception of a proper 'Christian astronomer'. Flamsteed's and Hooke's argument over which side of a plano-convex object glass should be turned towards the object viewed, Flamsteed's correspondence with William Molyneux and Flamsteed's response to Newton's optical writings are all utilized to uncover Flamsteed's conception of 'propriety, skill and knowledge'. Additionally, although William Ashworth's article deals with a later period, the Flamsteed and Newton controversy that began after Francis

Baily's 1835 publication of a life of Flamsteed, it shares with the above articles a focus on models, images and morals. The disputes between the supporters of Newton and those of Flamsteed illuminate a variety of issues such as the moral attributes associated with different scientific styles as well as the institutional alliances they represented.

The remaining articles touch on a wide variety of issues surrounding Flamsteed. Mordechai Feingold discusses Flamsteed's dealings with the Royal Society up to the point of his expulsion from its fellowship in 1709. He explores how the foundation of the Observatory and Flamsteed's appointment as its director turned out to be the pivotal factor in 'the alienation of Flamsteed from the Royal Society'. Hestor Higton makes the important point that 'the story of the development of astronomy cannot be told without incorporating the story of instrumental problems and possibilities'. She uses some of the letters between Flamsteed and William Molyneux to illustrate a few of the technical problems and limitations associated with seventeenth-century astronomy. Rob Iliffe explores Flamsteed's views on the appropriate training for naval officers and navigators. Demonstrating that for Flamsteed the key issue was the difference between 'the dull blockhead and the curious, ingenious or inventive scholar', he traces some of the arguments over the value of theory versus practice surrounding the staffing of the Royal Mathematical School at Christ's Hospital. The subsequent paper by Ian Stewart turns to a broader exploration of Flamsteed's contacts with the educational milieu, providing, for example, an interesting account of Flamsteed's attempt to win the Savilian Chair at Oxford. Sir Alan Cook gives a detailed description of Flamsteed's troubled dealings with his colleague Edmond Halley. Beginning in 1675 during their period of close collaboration, Halley assisted Flamsteed during his absence and made observations at St Helena of the southern stars that greatly augmented Flamsteed's programme. A variety of factors, however, aggravated the potential for rivalry that had always existed, and Sir Alan explores the details of their falling out as well as some of Halley's activities as Flamsteed's successor. In an article that supplements Sir Alan's,

Owen Gingerich provides an account of his recent acquisition of a set of the printed pages excised from unsold copies of the *Historian Coelistis* of 1712. Comparisons with the published versions as well as manuscript material from Flamsteed's papers allow Gingerich to provide a captivating account of what happened to Flamsteed's original catalogue. Finally, Adam Perkins's paper sketches the history of, and provides the context for, Flamsteed's papers that are preserved in the Archives of the Royal Greenwich Observatory. Together with Willmoth's summary catalogue of papers held there, Perkins furnishes scholars with a valuable aid to research in the Royal Greenwich Observatory Archives. Taken together, these papers are a valuable contribution to Flamsteed scholarship.

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CROSBIE SMITH, *The Science of Energy: A Cultural History of Energy Physics in Victorian Britain*. London and Chicago: The Athlone Press and University of Chicago Press, 1998. Pp. xi + 404. ISBN 0-485-11431-3, £55.00 (hardback); ISBN 0-485-12145-X; £19.95 (paperback).

The Science of Energy, by Crosbie Smith, is a sweeping cultural history of the development of the science of energy in Victorian Britain. Smith claims that the key doctrines of energy physics depended upon an informal network of scientific practitioners. Thus a core group of 'North British' scientists and engineers, including James Prescott Joule, William Thomson, Macquorn Rankine and James Clerk Maxwell, constructed the science of energy by working in three local contexts: Scottish universities, Clydeside marine engineering and British scientific societies. More broadly, Smith demonstrates that the cultures of Scottish Presbyterianism and industrialization intimately shaped the formulation of energy physics.

Borrowing terminology from Bruno Latour and Steven Woolgar's *Laboratory Life* (Princeton, 1986), Smith argues that the 'North British' group engaged in a carefully managed quest for 'credibility'. Hinging on the notion

that the contents of science are ‘symbolic capital’, Smith’s economic model of scientific activity integrates three meanings of credibility: believability, business trust and confidence of others. Smith’s primary argument is that the ‘North British’ group, via a ‘spiral of credibility’, rose in status within both the scientific community and larger public arena. Upon enhancement of local credibility, the group widened its search to include national, imperial and international contexts.

Adaptation of the ‘credibility’ model pervades Smith’s account, sometimes to the point of distraction. In fact, one may wonder if the main participants were as deliberately calculating in their actions as Smith implies: ‘the key players not only added to their number, but, through careful stage management, attracted national and international recognition. As a result of their strategy, they enhanced their scientific credibility to such a degree that even in their own lifetimes they became international stars of science assured of a place in every hall of fame of physics’ (p. ix). Throughout Smith’s account, the promoters of the ‘science of energy’ seem to have intentionally staged an ‘energy coup’ of sorts to meet their incessant search for international ‘credibility’. Smith’s ‘credibility’ model may be useful, but it is less convincing when considered with his professed goal of presenting the historical events as ‘perceived by the protagonists of energy physics themselves’ (p. 12).

These caveats aside, *The Science of Energy* undoubtedly provides a penetrating study of the contexts in which Victorian energy physics evolved and eventually flourished. Perhaps the most interesting analysis is that of the nineteenth-century cultural transformations of Scottish presbyterianism (Chapter 2) and industrialization and their formative influences on the ‘North British’ group. Smith, for instance, clearly demonstrates how the researches of the Thomson brothers relied on a Scottish engineering tradition which analysed and eliminated causes of waste (Chapter 3). Furthermore, the ideals of minimizing waste and maximizing work were also deeply connected with the Scottish Presbyterian view that mankind had a moral duty to accept God-given gifts, be they spiritual or material. Once refused or wasted, material

gifts of power became irrecoverable to humans; thus the second law of thermodynamics is linked to Presbyterian culture.

The Science of Energy is too sweeping in scope to be adequately condensed in a brief review. Nevertheless, summarizing several chapters will illuminate its general contents. While discussing the origins of Joule’s concept of mutual convertibility of heat and work, Chapter 4 also examines his quest for credibility via the British Association. The next three chapters largely focus on a key member in the ‘North British’ group, William Thomson: his efforts to reconcile the ideas of Émile Clapeyron, and later Sadi Carnot, with those of Joule (Chapter 5); his correspondence with Rankine on the dynamical theory of heat and the evolution of Thomson’s ideas regarding the directionality of natural processes (Chapter 6); and his use of Hermann von Helmholtz’s ideas to advance the cause for energy physics, largely via the British Association (Chapter 7). The next chapters evaluate the consolidation of thermodynamics (Chapter 8), culminating with the publication of Thomson and P. G. Tait’s *Treatise on Natural Philosophy* (Chapter 10). Smith persistently emphasizes that these triumphs were neither simple nor inevitable; for example, ‘North Britain *versus* metropolis: territorial controversy in the history of energy’ (Chapter 9) illustrates the conflicts which arose as energy physics moved into different contexts.

Smith uses the ‘credibility’ model throughout the book. Thus members of the ‘North British’ group mutually bestow credibility upon one another; exchange credibility with outsiders (e.g. Helmholtz); and deny credibility to those dissenting from their core beliefs (e.g. John Tyndall). In addition, he reinforces the particular Scottish circumstances in which energy physics evolved: ‘[Thomson and Tait’s] construction of dynamics centred on work and energy was radically contingent upon Scottish academic, religious and industrial culture. There was thus nothing self-evident or essential about the authors’ choices’ (p. 202). Repeating this claim in the Epilogue, Smith writes, ‘I have adopted a historicist approach which places emphasis on a contextualist account of the rise of the science of energy at a particular time and place’ (p. 313).

The final chapters continue this approach, discussing another key member of the 'North British' group, James Clerk Maxwell (Chapters 11 and 12) and the establishment of electrical measurement standards (Chapter 13). Largely based on Bruce Hunt's *The Maxwellians* (Ithaca and London, 1991), the last chapter (Chapter 14) explains the mathematical and conceptual transformations of Maxwell's theory of electromagnetism, primarily at the hands of George Fitzgerald, Oliver Heaviside and Oliver Lodge. Meanwhile, in Germany, the legacy of the 'science of energy' met with another set of interpretations. While 'Maxwellians' located energy in the surrounding field and began reifying the concept, the 'Energeticist' school of Wilhelm Ostwald substituted energy for mass as the primary 'substance' in nature.

As Smith demonstrates, the legacy of energy physics continued to be debated and transformed in a multitude of local and national contexts. Some may wish to modify or disavow Smith's 'credibility' model or his specific notions regarding the 'construction' of scientific ideas. Nevertheless, for its insightful contextual analysis and its breadth of scope, *The Science of Energy* makes a valuable contribution to the history of Victorian physics.

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H. F. AUGSTEIN (ed.), *Race: The Origins of an Idea, 1760–1850*. Key Issues, 14. Bristol: Thoemmes Press, 1996. Pp. xxxiii + 260. ISBN 1-85506-455-3, £45.00 (hardback); 1-85506-454-5, £14.95 (paperback).

GRAHAM RICHARDS, *'Race', Racism and Psychology: Towards a Reflexive History*. London: Routledge, 1997. Pp. xvii + 372. ISBN 0-415-10140-7, £50.00 (hardback); 0-415-10141-7, £10.99 (paperback).

As Graham Richards forthrightly declares, 'Races as objectively existing biological entities do not exist' (p. x). But the powerful place representations of race have in Western scientific and popular culture needs no emphasis. This is surely a topic – irreducibly ethical, as it involves choices about how to live – on which historical

resources have the utmost value. The claim that race is a scientific category has been often made, though in such complex ways and highly charged contexts that to write its history requires patient research and reflective historiography. These two books do much to achieve this in two key areas, enriching what has been done by scholars like George Stocking and Nancy Stepan.

Hannah Augstein has edited and introduced a series of extracts and articles from the decades when the very loosely used word 'race' gradually began to denote a concrete biological entity, thus providing scientific authority for the racist politics so prominent in the late nineteenth century and beyond. Her starting point is the argument that the biological questions first posed in the mid-eighteenth century, notably by Buffon, about human beings as a natural species found an answer a century later in theories of race. She has selected English-language primary sources to demonstrate this. Such is the diversity of contexts in which variation and difference were at issue, however, that it is not really clear whether these materials form a single and connected debate; nor does the format – to provide students with sources with which to debate 'key issues' – permit systematic discussion of what other sources, primary and secondary, are available to round out a history. The introduction goes some way towards this and could usefully have been extended. Each extract is preceded by a very brief résumé identifying the author and his context. The book is about the terms in which biological thought about race began, not about the causes of attraction to such beliefs.

These extracts clearly show that what to the late Victorians was a 'natural' division by race had not been at all 'natural' a century earlier. The selection begins with Buffon's definition of a species as an interbreeding group, and the selection proceeds by way of authors like Lord Kames, E. A. W. Zimmerman, J. F. Blumenbach, William Lawrence, J. C. Prichard, and J.-J. Virey to the paranoid stress on race in Robert Knox (1850, where the selection ends). The editor suggests that it is above all the failure of the eighteenth-century view that climate accounts for difference that led to the opposition of monogenist and polygenist views – the debate about whether humans belong to one or more

species that many historians think is the key to nineteenth-century anthropology. Much of the selection has been made from the *Monthly Review* and other reviews, making otherwise scattered material accessible. Though a number of the original authors are not anglophone, this collection presents their appearance in the anglophone world. Reading through, one gains a vivid sense of the range and bewilderment of the issues which faced attempts to balance discussion (this is a point Graham Richards returns too) of the simultaneous unity and diversity of humankind in physical, cultural and linguistic dimensions. Whereas later racial theorists thought they had a clear-cut answer, earlier authors sought in a great number of ways – speculating and judging about hybridization, the roots of language, climate, geographical distribution, the Bible, slavery and historical conquest – to find the key. Terms like ‘family’, ‘tribe’, ‘species’, ‘nation’ and ‘race’ cut across or substituted for each other. Only slowly and incompletely did the emphasis on physical characteristics, such as skull size and form, gain authority. The complexity and sheer indecisiveness of different speculations is well conveyed.

Graham Richards’s book is a substantial historical synthesis and demolition of the viability of race as a category in its own right. To my knowledge, it is the first systematic history of the presence of ‘race’ as a concept in psychology over the century in which psychology has been a scientific discipline. The thoroughness of his empirical research and the clarity of his analysis mean that the book will remain a reference point for many years. The centre of the history is the attempt in the inter-war years to construct ‘racial psychology’, but Richards has explored much more widely what he sensibly differentiates as ‘racialist’ work: the use of racial ideas – whether consciously or unconsciously – even where there is no intent to prescribe a racial preference. This takes him far beyond the debates about intelligence and heritability with which racial ideas are most often associated. His single limitation is that whereas he provides systematic and detailed coverage of the English-speaking world (the British empire, along with the United States), his only extended foray into

the wider European setting is in reference to German race psychology of the 1930s. However, his coverage is already formidable, and at all times he writes with energy, wit and sharp insight.

All this makes the book extremely valuable for historians of the human sciences. Beyond this, however, the book works at another level, which deserves to bring it a wider audience. Of all concepts in the history of science, ‘race’ must be one of the ones most obviously lacking in ethical neutrality. Richards deals with this with a degree of reflectiveness and rhetorical skills which makes this book a model for discussion of relations between the human sciences and the history of the human sciences, even for scientists who are not used to presenting their political values upfront. Richards wants his book to be read by psychologists, and he wants it to raise anti-racist consciousness, by clearly delineating the place that race ideas have had in the field. He achieves this by writing history, not by making cheap points. His capacity to take seriously the reflexive nature of the subject matter of psychological research, and the parallel capacity to reflect critically on what his own stance implies, makes an extremely rich book. He knows that any discussion of identity and diversity in humankind enters a hall of mirrors, and his ability to negotiate this hall with both historical detail and ethical precision is admirable. The concluding chapters and the extensive bibliography make this as valuable a resource for psychologists and social scientists as for historians.

The book begins with a brief overview of the background to Christian thought on human difference and to the (frequently anti-religious) scientific racism in the period before the First World War. This includes some noteworthy remarks on Galton, whose vicious views on native peoples Richards is not so willing to forgive as the curious aspects of a Victorian eccentric. He then places much stress on the Cambridge University Torres Straits expedition of 1898, which he describes as the moment when scientific psychology attempted directly to replace speculation through the empirical study of racial difference – and left a legacy, at least in Britain, of scepticism about the value of such research. Four long, detailed and informative

chapters then systematically examine 'race' in the literature of North American and then British (and British empire) psychology until the Second World War; a section on German race psychology is included. Not everyone will wish to read through the detail, but it is important that Richards is scrupulous as to his sources, since the authority once invested in these sources rested on their claim to empirical and methodological rigour. He makes the interesting argument that the long-term effect of racist psychology was not so much to spread racism (this was already there) but to bring to consciousness articulate and ultimately self-critical thought about race. He also brings out the dramatic contrasts between psychologies on either side of the Atlantic, as the African-American presence in the United States, and to a lesser extent the pressures of immigration, stoked up the race issue, while British psychologists often showed indifference (which is not to say that 'racialist' thought was not also common). The attempt to create a specific race psychology, initially supported in the context of debates about Negro education, had been largely abandoned in the US by 1930, and was replaced by studies of difference in relation to social background and attitude-formation. Two chapters on the post-1945 period then examine the emergence of work (for example, on the authoritarian personality) informed by the Nazi experience, by the Civil Rights movement and the rise of an African-American consciousness in psychology. This leads into a discussion of the issue that has dominated the last three decades: the debate about the claimed linkage of heritability, race and IQ. With an understandable weariness, Richards feels constrained to describe again the repeated attempts of a small but very visible group of psychologists to assert this linkage. The technical criticisms are hard to grasp, but Richards is firm in his conclusion that a 'scientific' dissolution of this dispute has long been available, and that it is only the racist purposes of some psychologists, substantial funds and the interests of editors and publishers that keep the issue in front of the public.

'Race' is a topic on which cliché, superficiality and failure to clarify the conceptual and ethical content, as well as empirical reference, of statements are all too often evident. In these two

books there are resources for thinking in much more subtle and reflective ways. Augstein's collection lays out many of the topics and terms which we need in order to understand the context in which the concept of race acquired currency. Richards's book is an invaluable discussion of the history of that concept in its many incarnations in psychology. It will fascinate anyone puzzled by his question: 'How are we to integrate the competing imperatives to both deny and affirm difference?' (p. xii).

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STEPHEN G. ALTER, *Darwinism and the Linguistic Image: Language, Race, and Natural Theology in the Nineteenth Century*. Baltimore: Johns Hopkins University Press, 1999. Pp. xiii + 193. ISBN 0-8018-5882-8. £32.50 (hardback).

The rhetoric of Darwin's *Origin of Species* (1859) has been much discussed; that of the *Descent of Man* (1871) hardly at all. In his new book Stephen Alter draws our attention to a remarkable rhetorical gambit in the *Descent*. There Darwin broke off from a discussion of the evolutionary origins of language to list a number of parallels between languages and species. Like species, languages showed homologies due to descent from a common ancestor. Both languages and species showed analogies due to formation under similar conditions. Both showed correlated growth, the effects of use, the persistence of rudiments and so forth – ten parallels in all, on Alter's count. His study of the history of such comparisons aims to explain how Darwin used them to further his argument on evolution. More broadly, Alter uses the case of Darwin and language to explore the power of analogies to influence scientific debate.

Along with geology and comparative anatomy, comparative philology in the mid-nineteenth century was a model science of the past. Following Gillian Beer, Alter argues that comparisons of language-change and species-change tapped understanding of the former to promote understanding (and acceptance) of the latter. The chief 'linguistic image', the branching tree

of the Indo-European language family, became an agent and emblem of the Darwinian thesis of descent with modification. As Alter shows, between the 1830s and the 'analogic zenith' (p. 99) of the *Descent*, language-species comparison cropped up in the writings of Darwin, Louis Agassiz, Asa Gray, F. Max Müller, Charles Lyell, Thomas Huxley, Frederic Farrar, Ernst Haeckel, and Haeckel's philological colleague at Jena, August Schleicher, among others. The cumulative effect, Alter suggests, was to habituate the public to the idea of branching descent (the final chapter of the book reproduces the forest of tree-diagrams – biological and linguistic – in which readers of a century ago found themselves).

Two key themes emerge. The first is the relation between natural theology and language-species comparisons. Alter shows that men of science on both sides of the transmutation question used such comparisons to support belief in God. Where the creationist Agassiz held that neither languages nor species were related by descent, the excreationists Gray and Lyell argued that, in languages and species both, a divine intelligence guided variation and therefore natural selection. The second theme is the relation between human languages and human races. In the *Origin* Darwin had illustrated his view that genealogical classifications were the most natural by arguing that the pedigree of races would at the same time be the pedigree of languages, and so the basis for a natural system of language classification. In the 1860s, however, revisions in estimates of human antiquity dashed hopes that language change and race change might map onto each other. 'Because language and racial biology were now uncoupled in fact', Alter concludes, 'they tended to be so figuratively as well' (pp. 70–1).

So what did the *Descent* parallels do for Darwin? On Alter's reading, the parallels did polemical work. Specifically, they undermined two doctrines: theistic evolutionism, of the sort championed by Gray and Lyell; and the race-language mapping proposed by Darwin himself in the *Origin*. None of the ten parallels dealt with these doctrines explicitly. Alter detects the argument against theistic evolutionism in the parallels dealing with homology, analogy, correlated growth and rudiments. He points out that

these concepts had ties to the theistic tradition of transcendental anatomy. Hence including these concepts among his parallels was Darwin's way of insinuating that God, even a variation-guiding God, had no hand in designing species. I suspect that what Alter has in mind here is a letter of 1863 (discussed earlier in the book) where Darwin noted that the 'origin of language [is] telling against each trifling variation being designed' (p. 66). But Darwin made plain his objections to Gray's guided-variation thesis in *Variation of Animals and Plants Under Domestication* (1868). Why would Darwin have stated the same objections so obliquely a few years later? Alter does not say.

As for race and language, Alter claims that Darwin was up on the latest thinking on the matter; that he had abandoned belief in the close mapping of races and languages proposed in the *Origin*; and that he effectively argued against the race-language mapping in the *Descent* by placing his discussion of race at a remove from his discussion of language. One problem here is that the supposedly abandoned race-language proposal survived intact through all six editions of the *Origin*. Furthermore, Darwin discussed the connection between race and language immediately after the ten language-species parallels. The text of the *Descent* continues, 'The perfectly regular and wonderfully complex construction of the languages of many barbarous nations has often been advanced as a proof, either of the divine origin of these languages, or of the high art and former civilisation of their founders.' Darwin made his target here explicit: the savage-as-degenerate view of biblical anthropology, recently defended in C. S. Wake's anti-transmutationist *Chapters on Man* (1868). Wake had cited a number of authorities on the existence of languages high on the scale of grammatical perfection among races low on the scale of intellectual perfection. Such mismatches pointed to degeneration from a pristine state, rather than to development from a brutish one.

I read Darwin as mounting the following argument against Wake. On the basis of the previous ten parallels, there was, Darwin urged, much to be said for borrowing from the naturalist in order to make sense of phenomena studied by the philologist. When it came to

perfection, the naturalist had one way of reckoning it, and the philologist another. Where the philologist rated symmetry above asymmetry in evaluating grammars, the naturalist, according to Darwin, 'justly considers the differentiation and specialisation of organs as the test of perfection'. True, the grammars of savage tongues exhibited greater symmetry than the grammars of civilized tongues; but this fact, reckoned against the naturalist's scale of perfection, made savage tongues less perfect, not more perfect. Adopt the scale of perfection appropriate to species and, Darwin concluded, the apparent perfection of the languages of primitive races became the predicted imperfection. The burden of the previous parallels was to make this switch to the more favourable scale of perfection seem reasonable.

When we bring the eleventh 'perfection' parallel into the picture, Alter's themes of language, race and natural theology come together in polemical fashion, though not at all in the way he suggests. Darwin used the language-species parallels to attack natural theology; but it was the older creationist natural theology, not its newer evolutionist counterpart.

Likewise, the views on race and language that Darwin defended with his parallels were far from the rather forward-looking views with which Alter credits Darwin. The point of drawing parallels in the first place was to show that the lower races had lower languages – just as the theory of evolution (as opposed to creationism) predicted.

Whatever we make of Alter's reading of Darwin, *Darwinism and the Linguistic Image* is a major contribution to our understanding of the career of an enduring trope of scientific discourse (consider memes and genes). There are excellent discussions of a number of topics, such as Gray's reading of the *Origin*, the often 'indirect debate' (p. 84) between Farrar and Müller, and the influence of Schleicher, not just on Haeckel's philosophical monism, but on his famous species trees. The emphasis throughout on how analogies can influence belief is important and persuasive. All told, Alter has provided a rich and rewarding account of the often subtle connections that bound the nineteenth-century sciences of language and life.

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