

(in marked contrast to the attention given to the ‘agency of nature’). So, for example, there is very little about the labour involved in different stages of the guano extraction and transformation (pp. 177–8), and almost nothing on land rights and ownership in the ‘input-intensive agriculture’, or on the production of explosives (p. 13), which are the main sources of demand for nitrates.

In the end, the ambition of a global ecological history of the droppings of Pacific Ocean birds becomes untenable and the line dividing this ambition from its actual realization as a collection of often fascinating vignettes wears very thin indeed. Where the book succeeds is in sampling a large number of environmental, geopolitical, and technological histories, and through offering valuable insights into the histories of scientific ideas, economics, and policies in different parts of the globe. Disappointingly, the central analytical threads that might have helped us make sense of the numerous agents and incidents presented, and thus evaluate the roles played by environmental and geographic factors, and the effects of technology and vested interests, are masked by an unnecessarily complicated narrative structure. Cushman’s evident mastery of his subject will make particular sections of the book useful for a wide variety of readers who are in search of specific kinds of information. If only the author had maintained a sharper analytical focus and deployed a more streamlined narrative structure, this book could also have made a more direct contribution to global history. Sometimes less is more.

The globalization of knowledge in history

Edited By Jürgen Renn. Berlin: Max Planck Institute, 2012. Pp. x+ 854. Hardback €87.19/£54.74, ISBN: 978-3-8442-2238-8.

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This book represents a work in progress, whose prime movers have been Peter Damerow, Malcolm D. Hyman, and Jürgen Renn. It is divided into six parts: the preliminaries and introduction, ‘from technology transfer to the origins of science’ (up to ancient Greece), ‘knowledge as a fellow traveler’ (Buddhism to the present), ‘local knowledge in the

global community’ (the Renaissance to the present), the ‘globalization of modern science’ (detailed surveys of modern science), and the index (pp. 839–54). Each of the parts has contributions by experts in the relevant fields, and is introduced by a rich and penetrating survey by Renn alone or in collaboration with Hyman.

Facing the first page, which summarizes the contributions, is a map of the world (p. 4) with arrows linking its regions to the chapters. In this map, the Jesuits appear in China (Spain is accorded no role), North America is associated with Los Alamos (Berlin, Copenhagen, and Leipzig are ignored), central banking is represented through Israel (Sweden and England are neglected), and Africa is tragically linked only to AIDS. This merely hints at the originality, dimensions, scope, and limitations of this monumental work: even at almost 900 pages no one can expect it to be more than a provisional survey of some aspects of what could – and should – be done, as Renn himself stresses at the outset (p. 3).

The book is at its weakest in discussing science and knowledge in antiquity. Damerow’s own contribution on early writing is the brilliant exception in an otherwise bleak landscape. One contributor states, for example, that texts ‘dating mostly from’ the Hellenistic era are ‘the foundation of Babylonian astronomy’ (p. 177), which is not only a *non sequitur* but also contradicts the same author’s observation that we lack an idea ‘of the genesis of later Babylonian astronomy’ (p. 188) – concerning which he reveals no curiosity. Obviously, this is not a basis for serious collaboration on a major issue. Another contributor remarks that the earliest treatises on mechanics ‘were written independently at about the same time’ (p. 271) in Greece and China, simply excluding the early ‘globalization of knowledge’ by assuming it away (incorrectly in the opinion of this reviewer). Unfortunately, such thinking is not unusual among the contributors to the section on the ancient world. Either they are outsiders lacking a profound understanding of the source material and what it has to offer, or they are specialists whose background does not permit them to cultivate competence in fields other than the ones in which they have the required expertise. This has allowed potentially important errors to pass through unchecked. The editor, who is not a specialist on the ancient world, shows no awareness of such problems. Indeed, for him modern science differs so radically from the zenith of thought in antiquity that what happened in antiquity is of little relevance.

Another significant weakness of this book is that, while some contributors focus on 'science', others focus on 'knowledge', leading to confusion about its remit and intention. This also fosters ambiguities in the book's treatment of 'science' and 'knowledge' in general. If the volume has a grand narrative it is the tortuous trajectory by which modern Western science has come to be an impartial, universal 'self-reinforcing mechanism [linking] the production of scientific knowledge with socioeconomic growth' (p. 220). Science is viewed as 'truth-oriented' and 'technology-oriented' knowledge – and 'nuclear physics' rather than, say, 'economics', is viewed as 'policy-oriented knowledge' (p. 582). Some of the contributors even celebrate 'the triumphalist rise of modern science' (p. 349) as the 'Europeanization of knowledge', whereby European science is transmitted from the 'center' to the 'periphery' (pp. 321–3). One contributor notes that 'to understand the Chinese reception of European science' we should understand what was there before, since it was only late in the day that China 'attained a new stable structure that incorporated modern science' (p. 270). Because the section on antiquity is brief, neglects Gnosticism, and plays no substantive role in the remainder of the book, one may conclude that the work is not so much about the globalization of knowledge but about the origins, diffusion, and role of modern Western science.

Yet this does not mean it is like other histories of science. The great strength of the book is its insights into the story of how the Europeans carved a narrow path which eventually became a wedge separating the vast, rich landscape of pre-modern knowledge from modern science. It deepens our understanding of how modern science emerged. From this perspective, then, levelling the ruins of ancient Greek thought allowed the foundation of the new edifice of modern science to be erected, marginalizing all other forms of knowledge and changing human life for the better, both cognitively and materially.

Comprehending the relationship between the Renaissance, the Enlightenment, and Western Christianity in facilitating this radical breakthrough is probably one of the most important issues in human history. The editor seems to believe that salient development was epistemological; the conflict between state and church over authority opened a door allowing sceptical doubt to shine forth with the Copernican Revolution (e.g. p. 219). 'Scientific knowledge' was later transformed by the luminaries of the Enlightenment from being the neglected

preserve of merchants and monks in the pre-modern world to becoming the guiding light and hope for virtually all of humanity.

The final part of the book gestures to 'the globalization of modern science' by discussing Soviet psychology (though not Islam) and summarizing the Western elite's understanding of knowledge. In the view of the editor, 'science' and 'knowledge' have gone different ways, with science victorious (pp. 235–6).

The editor stresses that modern science is founded upon earlier discarded models which unwittingly generated the nucleus. He conceives this book as an account of how this nucleus broke free and became the centre around which other forms of knowledge now spin. Certainly, the editor is correct that Christianity played a unique role in enabling the preservation and transformation of knowledge into modern science. Yet, though 'religious systems are constantly challenged by new knowledge' (p. 32), history seems to confirm the opposite. The editor notes that Islam has an 'immune reaction' to Western science (p. 224) and that in China traditional beliefs served 'as a strong selective filter' to the 'appropriation of new technological knowledge' (p. 31), which, as one contributor observes, the Jesuits 'were ultimately unable to crack' (p. 275).

It is assumed in this book that 'the staying power of science and its relative stability are based on its roots in technology with which humanity reproduces its social systems' (p. 561). Yet, again, this does not quite do justice to history. The editor recognizes the contradictory nature of the ideologically driven bureaucracy inhibiting certain paths in the development of science in pre-revolutionary China but does not dwell on this. Neglecting the fact that the Christian West proved unable to inhibit the development of science, he stresses the conflict of church and state. Interestingly, secular Western science flourishes around the world, above all in regions not wedded to monotheism, such as in the former Soviet Union, and in India, China, and Japan. Indeed, with the dominance of isomorphic Western-style university teaching, the idea that modern universities 'were developed in the West has lost much of its meaning' (p. 605). It would thus appear that Western Christianity had some specific weakness and that other ideologies can resist or incorporate science in very different fashions – and yet the result is the dominance of a truly Western science. There are mysteries here.

Unsurprisingly, the book closes with the optimistic expectation that Western science can

contribute to a better world, despite science's numerous problems and drawbacks. The editor acknowledges that some 'doubt the role of science as a privileged form of knowledge' (p. 571), conceding that 'science turned out to be incapable of coping with the ethical challenges posed by the transformation of its scaled-up economic, political and military implications into criminal abuse' (pp. 569–570). While recognizing that the fragility of science lies in its dependency on society, he remains persuaded that 'the very survival of humanity is determined ... by the growth of science [and] scientific progress' (p. 561). The seemingly value-free nature of Western science may explain its acceptance around the globe, but also suggests that its measure of success is pecuniary rather than 'truth-seeking'.

This book offers many insights into – and bibliographical references on – fragments from the mosaic of the history of the development of modern science. Readers are given the means to confront both their own interpretations and the editor's logic, to juxtapose familiar and new ideas. They will not regret spending the time and effort required to read and digest what is on offer here. The only regret will be that there is not more.

Farben der Globalisierung: die Entstehung moderner Märkte für Farbstoffe 1500–1900 (Colours of globalization: the genesis of modern markets for dyestuffs 1500–1900)

By Alexander Engel. Frankfurt am Main: Campus Verlag, 2009. Pp. 386. Paperback €39.90, ISBN: 978-3-593-38869-4.

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At the start of this book, Alexander Engel positions himself firmly inside major debates on the history of globalization and the history of markets. He distinguishes between 'economic globalization', which began in the late nineteenth century, and the far earlier 'sociological globalization' (as elaborated by Wallerstein *et al.*), and presents a very condensed, highly informative history of the concept of a market (Chapter 1). With such an ambitious start, the author makes it clear that he is perfectly at home with the broader issues relevant to his case study.

In the rest of the book, where he discusses the history of dyestuffs markets in light of these broader issues, he also demonstrates complete mastery of his subject matter. He is at his best when showing the wider relevance of the minute details of the production, sales, and uses of certain dyestuffs.

For the readers of this journal, it is important to realize that Engel does not discuss the globalization of dyestuffs markets in general. Rather, he focuses on what he calls the 'European global market'. Asian and American dyestuffs markets are not discussed in their own terms, but only in relation to European industry and trade. From that particular viewpoint, the author reveals how a European market for dyestuffs emerged during the Middle Ages, partly supplemented by dyestuffs traded via the Middle East. In the sixteenth, seventeenth, and eighteenth centuries, dyes cultivated in Europe (such as woad and safflower) were increasingly replaced by imports of dyestuffs from America and Asia (indigo, cochineal, lack dye, and logwood). With the emergence of the synthetic dye industry in the nineteenth century, especially after 1880, trade relations were reversed: Europe became a production centre of dyes that were now exported to Asia and other parts of the world.

These general trends are perhaps not very surprising, but the details presented and analysed in the core chapters of Engel's book (originally from a PhD dissertation) make this work the best synthesis available at present within the voluminous literature on the history of natural and synthetic dyestuffs. Two general features stand out: first, the book does a wonderful job of integrating the history of science and technology with social and economic history; second, it covers four centuries of market development, thereby showing that the transition from a natural to a synthetic dye industry was far more gradual than often claimed.

The author does not give a strict chronological account of the development of the dyestuffs market between 1500 and 1900. Instead, he approaches his topic from three thematic angles, and by so doing he achieves great analytical depth. He opens with an innovative overview of techno-scientific and commercial developments (Chapter 2), distinguishing four, partly overlapping, socio-technical regimes: (1) a regime of mercantile integration (c.1200–1700) between agriculture and trade, between northern and southern Europe, and between Europe and overseas areas; (2) a regime of 'oeconomic botany' (c.1600–1800), based on growing knowledge of improvements in cultivation, and characterized by