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Structures of Change in the Mechanical Age: Technological Innovation in the United States, 1790-1865. By Ross Thomson. (Baltimore: Johns Hopkins University Press, 2009. xiv + 432 p., notes, bibl., tab., index. ISBN 978-0-8018-9141-4 \$68.00)

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deuxième édition, par ailleurs révisée et abrégée. Toutefois, si l'on songeait un jour à la rééditer, peut-être pourrions-nous alors réclamer l'ajout d'images (présentes dans la première édition) ainsi qu'un index de noms communs venant compléter celui des noms de personnes. En attendant, elle constitue une excellente ressource pour tout professeur et étudiant, tant au niveau universitaire que collégial, ou pour toute personne souhaitant parfaire ses connaissances sur ce « long tâtonnement » que sont les sciences de la vie (Hugo, *William Shakespeare*).

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Technology / Technologie

Structures of Change in the Mechanical Age: Technological Innovation in the United States, 1790-1865. By **Ross Thomson**. (Baltimore: Johns Hopkins University Press, 2009. xiv + 432 p., notes, bibl., tab., index. ISBN 978-0-8018-9141-4 \$68.00).

Those familiar with Thomson's earlier study of the mechanization of shoe-making in America will welcome eagerly this wider study. The breadth of the book is indicated by its title. But pinning down just exactly what the book is about is not so easy. It is not a general history of American technology. It is not a chronicle of mechanical inventions in America. It is not a history of American industrialization nor of the rise of secondary manufacturing in the American economy. But it has aspects of all of that. Perhaps the best characterization is to say that it is about flows of technological information. There was a lot of that information around; it moved in certain paths among certain people or types of people via certain channels. This book identifies what those paths were, how they came to be and what the consequences were.

In the author's own words his thesis is that "technological change was a process of institutionally structured learning in which innovators gained knowledge through established communication channels, and innovations spread knowledge in ways that fostered further innovation" (p.4). Thomson is very good at showing us the diversity of paths taken by different industries as well as their interconnectedness. However his presentation of the complex web of influences and feedback loops shades into an everything-connects-to-everything-else argument better left to James Burke and Dirk Gently. Shunning recent work in the sociology of technological knowledge, Thomson's approach is instead strongly empirical and information dense. While exhaustively researched in patent

and census records and the contemporary technical literature, the author's presentation of his material can be at times fatiguing. Typical of the prose is a sentence like "According to Sokoloff and Khan, machinists and toolmakers increased steadily from 4 percent of urban patents through 1804 to 17 percent from 1836 through 1846, and other metalworkers increased their share from 8 to 21 percent over the same period" (p.109). And while the data are useful some of it is pretty unsurprising; that inventions made by farmers were mostly agriculture-related will raise no eyebrows.

The author knows his mechanical stuff and wears it very lightly; narrowly technical, nuts-and-bolts, issues occasionally arise and are dealt with deftly. But although all the usual suspects (Eli Whitney, the Sellers, Oliver Evans and the like) are rounded up, Thomson's emphasis is neither on machines nor people but on institutions. These include firms, but in the era before Chandler's modern corporation the significance of the firm is muted. Instead Thomson argues and documents the significance of not just inter-firm but cross-industry linkages for the flow of technical knowledge. As well, the importance of the state, so often overlooked in writing on the history of American enterprise, is given its full value here.

It is unfortunate that Thomson does not more often steer away from the recitation of statistics to address broader issues, because he does have important things to tell us. The dialectic between wood and metal in American industrialization, so crucial to an understanding of America's industrial revolution, is well captured here. He downplays the significance of the American System of Manufacturing, seeming at times hostile and disparaging towards that usage. Thomson strikingly documents how broad and sustained was the technological dialogue between the US and Great Britain. He shows too that Yankee ingenuity and good old American know-how had a formal content to it early and often. Connections between science and technology were widespread and explicit even if causal relations are hard to pin down. Inventors as a group were vastly better educated than the general populace. His chapter on the US patent system is about the best discussion of the topic that I have read. He hammers home the key point that the patent system was as much or more about spreading information than it was about protecting proprietary rights. While he does not use the term, "learning by patenting" might be a helpful concept and is what he describes very well in most of that chapter. Having said that, I am uncomfortable with the author's very heavy reliance on patent data. Patent data are the historian of technology's most dangerous friends. Thomson is aware of that and indeed discusses the issues and problems surrounding the use of such data but in the end rushes in where others might tread more gingerly.

It is of course a simply matter for a reviewer to identify lacunae in a book of this scope and brevity. But to play fair with the author let me name only a couple which seem especially troublesome. This is a book on the development of the US economy between 1790 and 1865 which a reader could complete and not learn that slavery existed. That doesn't work. Not only is the existence of slavery a significant explanatory variable when looking at the geographic distribution of patenting, slavery was in fact much more important to the industrial economy of the United States than has generally been recognized. One very important class of institutions is not mentioned in this book, insurance companies. Their role in the evolution of steam technology cannot be overestimated and they were significant in other sectors as well. Strangely, the manufacture of precision scientific, navigational and survey instruments is not covered. Readers of this journal, aware of how continental was the pool of North American technology, will question Thomson's insistence on the importance of the national boundary in defining the limits of an innovative system even at times when he presents information to the contrary. Nova Scotian Abraham Gesner for instance is mentioned but his nationality is ignored.

At the end of his book the author himself hints at fundamental changes to come in the post-bellum world and America's second industrial revolution. His study will help us in framing questions about how much of the elaborate network of individual and institutional relationships would be subsumed into, how much superseded by and how much would endure after the rise the corporations and new national organizations (engineering societies, standards bodies and the like) after the Civil War. This is a book we will be consulting and sending our students to for a long time. How it contributes to any important new synthesis will remain to be seen.

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***Accident Prone: A History of Technology, Psychology, and Misfits of the Machine Age.* By John C. Burnham.** (Chicago: University of Chicago Press, 2009. 336 p. ISBN: 9780226081175 \$40.00).

John C. Burnham's *Accident Prone* is a biography of an intriguing idea—the “orphan idea” (p.144) of “accident proneness” which was born in the 1920s, reached the height of its popularity in the decade following the Second World War, and, at least among safety professionals, gradually lost ground to other ways of thinking about accidents from the 1960s onward. This history of “the interface between humans and technology”