

The Chemical Industry in Europe, 1850-1914: Industrial Growth, Pollution, and Professionalization, ed. by ERNEST HOMBURG, ANTHONY S. TRAVIS & HARM G. SCHRÖTER, Kluwer, Dordrecht, 1998, -X, 344 pp. (ISBN: 0-7923-4889-3)

The period from 1850 to 1914 was extremely important in the development of the chemical industry and in the professionalization of chemistry. Organic chemicals were being more widely used for pharmaceuticals, dyes, explosives, and fertilizers, and many of these materials were synthesized in the laboratory rather than obtained from natural products. Chemistry combined technology and science to become one of the most important industries in the period sometimes called the Second Industrial Revolution. Despite this, there are surprisingly few books that document these developments. This is, of course, related to the more general observation that historians seem to have been less interested in chemistry than some of the other sciences.

L.F. Haber's two books, *The Chemical Industry during the Nineteenth Century: A Study of the Economic Aspect of Applied Chemistry in Europe and North America* (Oxford 1958) and *The Chemical Industry 1900-1930: International Growth and Technological Change* (Oxford 1971) are still considered to be the standard treatments of the chemical industry during this period. *A History of the International Chemical Industry* by F. Aftalion (Univ. of Pennsylvania Press 1991) is an interesting account from a current practitioner, but lacks the footnotes and references that might make it acceptable to historians.

This new book is the result of a 1993 conference entitled 'The Evolution of Chemistry in Europe'. The authors represent diverse backgrounds, and many look at the history of chemistry from a broader perspective that includes interests in technology, social history, economics, or science policy. The editors

have included recent perspectives that were neglected in Haber's books. There is more recognition that science makes both positive and negative contributions to society, especially considering the impact of environmental pollution; the complex forces that determine whether or not a new technology is accepted have become better understood; and there is a better understanding that the internal structure of corporations plays a crucial role in development.

The editors have divided the current volume into three sections to correlate with the complicated factors that affected industrialization. The first section, patterns of industrialization, reviews chemical industrial development in Switzerland, Denmark, Italy, and Poland, in addition to reassessing the reasons why Germany was able to overtake and pass England as the major European chemical manufacturer. These chapters are not only overviews of the chemical industry in each country but also investigations of the economic, technological, organizational, and educational factors that determined industrial growth rates. The chapter by Christian Simon, which explores how Switzerland became a major chemical exporter despite the lack of raw materials, is particularly good.

The second section deals with environmental emissions, a topic that is barely mentioned in Haber's or Aftalion's books. There are several reasons why pollution became a serious concern in many parts of Europe in the latter half of the nineteenth century. Population was becoming concentrated into larger urban centers, increasing the contamination by urban waste water and coal burning. Industrial emissions were also increasing, due to larger scale chemical manufacturing operations and new methods like the LeBlanc Process. Increased industrialization drew attention to the social costs and the possibility of social unrest. The four chapters in this section discuss the situations in England, Holland, and Germany.

Initially, sewage pollution was of greater concern than industrial releases in

England. To delay or prevent new control regulations, the English chemical industry offered several arguments, including claiming that controls would endanger national prosperity, would not significantly improve air and water quality, or would be premature until the technical situation was better understood. Such rationalizations sound all too familiar today. Despite these efforts, continued river pollution, such as that produced from soda plants, finally resulted in the Alkali Act of 1863.

Chemists often played a key role in these debates by giving expert testimony. Thus, the attempts to control pollution ultimately contributed to an increased recognition of the importance of chemical training. The chapter on Robert Angus Smith, the first Alkali Inspector, also shows the crucial role played by trained chemists. Smith adopted such a balanced approach to emissions control that eventually even the companies he had regulated recognized that he had made a positive contribution.

Initially, the emissions of greatest concern in the Netherlands were the combination of sulfuric acid and sugars associated with the production of garancine, a red dye extracted from madder. Soon, sulfuric acid and alkali plants were recognized as additional problem areas. As in England, the need for technical expertise caused both industry and regulatory agencies to turn to well-trained chemists for help. In Germany, the major concern was liquid emissions into lakes, rivers, and streams, such as the arsenic produced by the production of aniline dyes. The German chemical industry used arguments similar to those put forward in England to justify emissions, but an unusual rationalization was the idea that rivers were 'natural sewage canals' and so were an efficient and natural way to dispose of industrial pollution.

During the 19th century, chemical processes that had formerly been empirically based began to be placed on a more systematic chemical foundation. The transition was by no means universal, although in some cases, like dyestuff

production, academic chemistry did play an significant role. The third part of this book describes some of the individual scientists and specific companies that were involved in this process. Academically trained chemists sometimes used their skills as managers or consultants, but they also found employment as analysts and researchers. The chapters in this section discuss the position of chemists in the British alkali industry, the founding of the industrial research laboratory at BASF, the organization of an institutional research process at three German pharmaceutical firms, Bayer, Hoechst, and Schering, the role of French scientist's networks that included both academic and non-academic institutions, and the special role played by Alsace in the history of the dye industry. For example, analysis of the correspondence between some German and English chemists shows that while the German chemical industry was overtaking England, there was much more cooperation than had been believed. Chemical process control is an important topic that is often overlooked, and so the article on this topic is especially useful.

In the introduction, the editors suggest that a new approach is needed to better understand the emergence of the chemical industry and this book is an initial step in creating such a synthesis. It is not a replacement for Haber's classic treatment nor is it intended to be. It is, however, an excellent complement to the relatively few published studies of the development of the chemical industry during the late 19th and early 20th centuries. The references from the various chapters comprise a good bibliography, and several chapters offer new perspectives on issues that are of interest to historians of science. This book is an excellent resource for understanding how the modern chemical industry was created.

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