

chemistry from people and scientists from peripheral countries. Avoiding the mere enumeration of names and facts, he should profit from new historiographical considerations such as: How have new scientific ideas ‘migrated’ from centers to peripheral countries? What was the role of different external and internal factors in this ‘migratory’ process both in global and local scale? What were the specific characteristics of the process of their assimilation? What have been the particular forms of resistance in each country to the new developments? How was the particularity of their expression in each country related to its economic, social, and political life? What were the different profiles and social functions played by ‘scientists’ in the countries at the periphery? How were the different functions of the ‘scientists’ related to the different roles played by scientific and technological knowledge in the center and in the periphery? Answers to the former questions will help to characterize the mechanisms of birth and development of the new chemical ideas in the peripheries, and then to assess the similarities and differences of the perceptions of chemistry and chemical technology in different countries.

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Determinants in the Evolution of the European Chemical Industry, 1900-1939. New Technologies, Political Frameworks, Markets and Companies, ed. by A.S. TRAVIS, H.G. SCHRÖTER, E. HOMBURG & P.J.T. MORRIS, Kluwer Academic Publishers, Dordrecht-Boston-London 1998, xii + 393 pp. (ISBN: 0-7923-4890-7)

This book is the outcome of an international conference on the European chemical industry in the first four decades of the 20th century; it includes 16 articles, arranged in five different sections.

The first part deals with a new technology of the 20th century, high pressure industrial chemistry, which was, according to the editors, “nothing less than the ‘paradigm shift’ that thrust the chemical industry into the 20th century” (p. xii). The article by ANTHONY TRAVIS succinctly presents the development of the high-pressure ammonia synthesis and how high pressure chemistry became the “undisputed leitmotiv of the interwar chemical industry” (p. 21).

Part 2 is devoted to the impact of World War I. ROY MACLEOD describes in detail the “war of chemistry” on both the British and the German side. Scientists of both nations dedicated their knowledge to this deadly business, although their efforts, as MacLeod insists, were not decisive for the outcome of the war. However, their efforts transformed the image of science. LOTHAR MEINZER’s article examines the effects of the French occupation of BASF. Referring to the Haber-Bosch process, he convincingly shows that the confiscation of patents was of little use as long as the related contextual, tacit knowledge was lacking. The French had to find agreements with BASF, and the resulting contract between the two parties was, according to Meinzer, “the successful model” of a transnational technology transfer, setting “the pattern for similar activities during the remainder of the interwar period” (p. 63).

Part 3, entitled "Science and Industry", includes two very informative articles on R&D at IG Farben: one is on basic research at IG Farben (CARSTEN REINHARD), the other one on the emergence of heavy organic chemicals in the period 1925-45 (PETER MORRIS). In their introduction the editors write: "The German chemical industry, which was active in R&D even before World War I, turned, for a time at least, to basic questions and fundamental science" (p. xii). Given that the two articles the editors refer to deal only with IG Farben, and more specific with Ludwigshafen, one might question the generalization about "the German chemical industry". Another paper in this part (GEERT SOMSEN) highlights the controversially debated attempts of Dutch academic chemists to gain prestige and money from state and industry. Finally, in the interwar period, they successfully established a national research organization, founding the "Applied Scientific Research".

The fourth part is dedicated to the "different routes to competitive advantage". Three of five articles focus on Great Britain: the modernization of industrial organic chemistry (ANTHONY TRAVIS); the emergence of the profession of chemical engineering (COLIN DIVALL and SEAN JOHNSTON); and reasons for the little use of measuring and controlling instruments in the British chemical industry as compared to the USA (STUART BENNETT). Bennett argues that the craft based British approach "left ownership of knowledge in the hands of the skilled production workers" (p. 235) and that the management was unable to control the tacit knowledge that was passed on in the apprenticeship system. The fourth article is on the Norwegian Hafslung group and its neglect of the Odde process (KNUT SOGNER); the fifth deals with the Swiss pharmaceutical industry and the impact of patent laws on its competitiveness (JAKOB TANNER). Until the late 19th century, Switzerland had no patent law and was considered, with its imitation of products, as a "nation of industrial rob-

ber barons" (p. 263). The establishment of a patent law, as demanded particularly by the German industry, benefited the Swiss pharmaceutical companies that focused on highly profitable specialties. Tanner argues, however, that patents were only one side of the protection of knowledge; the other side was tacit knowledge: "Modern industrial enterprises try to protect this codifiable knowledge, which is susceptible to imitation, by means of patenting and secrecy. But the decisive immaterial or intellectual resource for the growth of firms are not patents, brand names, and industrial secrets, which provide temporary advantages, but the tacit knowledge which is strictly specific to every firm and cannot be fully copied by others" (pp. 267-8). This argument leads us back to the high-pressure ammonia process that could not be copied in spite of the capture of patents, because tacit knowledge was indispensable for its working.

The final part is dedicated to state intervention and industrial autarky. ROLF PETRI argues that chemical production in Italy was based on the needs of agriculture and traditional manufacturing until the 1930s. The lack of energy and raw materials apparently prevented the development of a modern organic chemical industry. That changed in the 1930s due to protectionism and the intervention of the Fascist state, accelerating R&D and supporting technology transfer from other countries. NURIA PUIG introduces the reader to the "frustrated rise" of the Spanish chemical industry. HELGHE KRAGH provides an overview of the Danish chemical industry, defining it rather broadly. And TIMO MYLLYNTAUS examines the relatively small Finnish chemical industry in the interwar years.

In conclusion, the book does not supersede the by now thirty years old study of L. F. Haber: *The Chemical Industry 1900-1930. International Growth and Technological Change* (Oxford 1971), which remains the general standard work on the chemical industry for this period. However, the articles in this volume, mostly of good or very good quality,

show that there has been made progress since concerning some European countries and particular aspects of the chemical industry. Yet, the field still offers ample opportunities. It may be added that the reviewer was sometimes wondering about the choice of countries represented in this volume – for example, the absence of France. Overall, this is a very stimulating book that presents us important results of research by historians of science and technology and economic historians on the European chemical industry in the first half of the 20th century.

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PAUL RABINOW, *French DNA: Trouble in Purgatory*, University of Chicago Press, Chicago, 1999, viii + 201 pp. (ISBN: 0-226-70150-6)

Paul Rabinow's *French DNA: Trouble in Purgatory* picks up where he left off at the end of his *Making PCR: A Story of Biotechnology* (reviewed in this journal Vol. 4, No. 2). After his study of the Cetus Corporation (which became Roche Molecular Systems), Rabinow was invited by Daniel Cohen to be a "philosophical observer" at CEPH (Centre d'Etude du Polymorphisme Humaine) a partially independent French research group which had ties with the AFM (Association Française contre les Myopathies), a patients organization similar to the American MDA (Muscular Dystrophy Association). Cohen led the CEPH to the first physical map of the human genome in 1993. Financial backing for this project was partially funded by the AFM, which saw that the genetic level was the next battleground in the study of the dystrophies. As there were already sociologists at AFM, Rabinow studied these relationships from the CEPH primarily. Cohen was also a co-founder of an American biotechnology start-up, Millennium Pharmaceuticals. Millennium and CEPH were to start a collaborative effort to work on the genetic basis of diabetes. It is this failed collaboration that prompted Rabinow's book to be an ethnography of failure rather than success.

It is from this failure that the book gets its title. The collaboration was eventually stymied because of genetic material that had been collected from a large number of French families. When one of the scientists, Phillippe Frougel, who was running CEPH's diabetes project, realized that his role in the Millennium collaboration would be very small, he balked, and leaked information to the government and the press. The government, which had already approved the collaboration in principle, reversed itself. The rhetoric was couched in terms of not