years after the war. It was inevitable, Stokes argues, that the United States would be forced to allow Hoechst to attain a comparable size. This policy fit well with the interests of West Germans, who wanted I.G. to be broken up into a few firms large enough to compete well in the international market.

Why were the successor firms so successful? Stokes concludes convincingly that the continuities from the preceding era—in organizational structures, managerial acumen and structures, systems of technology and information, leading personnel, and even physical plant—were most crucial. In addition, the new firms and their strategies adapted themselves to the dominant postwar American worldview. Their emphasis on export fit well into the ideology of free trade and assuaged the long-standing American fear of German autarky.

Stokes stresses the ability of former I.G. managers to be creative and adaptive in the postwar era, pointing out the irony that the same men often had exhibited the same qualities while serving the National Socialist state. But Stokes does not address one important issue in his fine book: did the close collaboration with National Socialism permanently alter I.G. Farben managers and thereby influence the postwar West German chemical industry? Stokes emphasizes that I.G. was willing to "howl with the wolves" during the Third Reich, but he does not say whether the reversion was permanent.

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Technology of Warfare

The War of Invention. Scientific Developments, 1914–18. GUY HARTCUP. Brassey's (Pergamon), McLean, VA, 1988. xii, 226 pp. + plates. $43.

In his introduction to this book, Guy Hartcup observes that, though World War I was the first major technological war in history, historians have not really attempted to assess the totality of the scientific and technological equipment developed in that struggle. In *The War of Invention* Hartcup attempts to fill this void by discussing not only well-known innovations like the tank and chemical warfare but also "less familiar advances involving physical, chemical and medical research which changed the face of warfare" (p. viii). He is further intent upon illuminating the role of the first "boffins," the scientists and engineers who invented the new equipment.

In this effort, Hartcup has relied primarily on documents in the British Public Record Office, explaining that Continental archives yielded much less information on technical aspects of the war and space permitted only brief references to American developments. The book is thus primarily an examination of British developments in the realms of chemical research in munitions, weapons for trench warfare, chemical warfare, naval and air warfare, medicine, and industrial research and does not fulfill the jacket's claim that it provides "a comprehensive view of the application of science and technology to military, naval and air operations in the 1914–1918 war." Only a much longer study of such developments in *all* the major powers could do that. If this work were taken as comprehensive, it would appear that the British were the primary innovators, though its tantalizing glimpses of French, German, and American events seem to suggest that such was not necessarily the case. Though Hartcup attempts to draw certain comparative conclusions at the end, it would seem necessary and appropriate to base such comparisons on more than the often cursory glimpses of developments on the part of the other warring powers.

The examination of aviation, a topic this reader knows better than others treated in the book, is occasionally problematic. In his discussion of the National Physical Laboratory's role in prewar aircraft research, Hartcup cites as a particular success story its collaboration with the Royal Aircraft Factory in the development of the prototype of the BE2C, the Royal Flying Corps's standard reconnaissance craft, which he then credits with a speed of 140 miles per hour (pp. 18–19). Yet contemporaries complained that the NPL's research was only belatedly disseminated to the aircraft industry as a whole. Furthermore, the BE2C, though a success when introduced in 1912, was a deathtrap for its wartime pilots, possessing a speed some 60 miles per hour less than that cited by Hartcup.

Hartcup's approach to the topic of aircraft engines is rather idiosyncratic. In concentrating solely on the rotary engine and specifically W. O. Bentley's improvement of the French Clerget he ignores important devel-

opments in V-type liquid-cooled engines, on which information is certainly available and which would have offered some fascinating comparisons of developments in all the powers.

Despite these problems, the book performs a valuable service in collecting information about widely disparate developments in science and technology in Britain in World War I and offering some interesting comparisons that may serve as the starting point for further comparative research in the areas discussed. The author presents much highly technical information in a fashion that makes it accessible to the general reader, not just to the scientists and engineers who should be intrinsically interested in *The War of Invention*.

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