The Loss of a Lead

Innovating for Failure. Government Policy and the Early British Computer Industry. JOHN HENDRY. MIT Press, Cambridge, MA, 1990. xx, 240 pp. $35. History of Computing.

Hendry presents here "a case study of what has become known as the 'British problem': the chronic inability of British industry to convert exceptionally high levels of technological expertise into commercial success in an international marketplace." He focuses on the National Research Development Corporation (NRDC), established in 1949 to stimulate and sponsor industrial development of publicly held patents. During its first decade, under the direction of Lord Halsbury, the NRDC devoted the bulk of its resources to capitalizing on Britain's early lead in electronic digital computers and to establishing a computer industry capable of competing with American firms, foremost among them IBM. The effort failed. By 1960, the U.S. computer industry was a generation ahead in design and held an insuperable lead in the number and cost of installed computers, both worldwide and in Britain itself.

Working from the archives of the NRDC and of some of the firms, as well as from interviews with industrial participants, Hendry chronicles Halsbury's campaign to coax reluctant manufacturers to assume the risks of commercial development of the computer. Conservatism was the main opponent. Computer experts could not see beyond a small number of large machines for scientific computing. The tabulating-machine companies worried about the short-term problem of retaining their customers in the face of new intrusions by American punched-card machinery and could not see the promise of leapfrogging to electronic data processing. Elliott Brothers and Ferranti had their eyes on computers for process control but saw them as long-range projects for which they were not willing to take short-term risks. Sharing Lyons and Company's view that the medium-range future of computing lay in the "electronic office" (LEO), Halsbury tried to broker a series of marriages between electronics and tabulating-machine firms to compete with IBM's line. None lasted far beyond the exchange of vows. Similar efforts to stimulate production models of research machines, thus wedding universities and industry, met with no greater success.

Aiming at a gap in the current policy literature on innovation, Hendry concentrates on the response of individual firms to the policies Halsbury was pursuing. In a final assessment, he emphasizes the internal and external contradictions in the NRDC's mission that doomed Halsbury's efforts to failure. Since no one was eager to go into the computer business, he was always the suitor, cajoling industries into undertakings they themselves had no interest in pursuing or would not pursue on their own. Yet he could offer little incentive for them to do so. Operating with limited funds advanced by the Treasury against the time the NRDC would become self-sustaining through royalties (which it never did), Halsbury could only enter into joint ventures with industrial partners. Although he was willing to assume the bulk of the risk against a small share of the receipts, he could not help any of his partners to a substantial competitive advantage without compromising the "fairness" expected of a public agency. Moreover, and perhaps more important, the NRDC could exercise little control and oversight over a partner's operations. Hendry shows that, in case after case, when the goals of the NRDC conflicted with those of the firm, the firm took care of itself. "Because of its limited capital and nominal duty to break even," Hendry summarizes, "the NRDC was always reluctant to gamble on products, but the consequence was that it gambled, perhaps unwittingly, on organizations." It usually lost.

The "British problem" may go back to Samuel Butler, who turned an adage around to expound, perhaps unwittingly, a truth of commercial exploitation: "Invention is the mother of necessity." Characteristically, it was American entrepreneurs who grasped that truth and created, rather than waiting for, the demand for telephones, phonographs, automobiles, computers, and other consumer items that we now think indispensable to modern living. As Kenneth Flamm has documented in *Creating the Computer* (Brookings Institution, 1988) and Hendry reminds us, the foresight of American computer entrepreneurs was sharpened by massive government funding of research and development. Nonetheless, in their concern to anticipate the needs and tastes of customers, American enterprise overcame in practice the simplistic, linear concept of technology transfer as applied science that Hendry believes blocked the NRDC from the start. In bringing science to market, research and development go hand in hand, and some of the enterprise must be devoted to the "low-tech" that makes "high-tech" usable outside the laboratory.

This is a book well worth reading, not only for the light it sheds on the uncertain beginnings of one of the world's major industries, but also for the help it provides in thinking through current innovation policies. The story it tells is not a history the United States should wish to repeat.

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Invertebrate Sounds

Arthropod Bioacoustics. Neurobiology and Behaviour. ARTHUR W. EWING. Comstock (Cornell University Press), Ithaca, NY, 1989. x, 260 pp., illus. $35.

Insect sounds are highly conspicuous components of our acoustic environment, and they have long drawn the attention of biologists, poets, and others who have wondered how and why insects sing. These questions are the focus of this book. As the title suggests, the scope extends beyond the insects to include material on crustaceans and arachnids. Nevertheless, the bulk of the work discussed (and, indeed, the bulk of the work that has been done) concerns insects.

The study of bioacoustics is highly interdisciplinary, drawing on insights from physics, ethology, neurophysiology, genetics, ecology, and evolution. Ewing's aim is to bring together findings from these diverse disciplines, and in this he certainly succeeds. The book is organized into chapters on the biophysics of sound, specializations and mechanisms for sound production and reception, the neurophysiology of hearing and sound production, behavioral functions of sound, genetics and evolution, and techniques. The first and last chapters provide the uninitiated reader with the technical basics needed to appreciate the biological content of the other chapters, which are essentially compilations of selected findings. Within many of the latter chapters the organization is by taxon. Occasionally, this obscures similarities that might otherwise be apparent; for example, in the chapter on neuroethology of sound reception a more