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Dealers of Lightning: Xerox PARC and the Dawn of the Computer Age, by Michael Hiltzik, HarperCollins, 2000, 480 pages, $15.00, ISBN 0-88730-989-5.

Many ECE engineers are aware that the *Windows* interface was not invented by either Microsoft or Apple, but rather at the Xerox Palo Alto Research Centre (PARC). However, that is about as much as most of us know about PARC. On reading this book (which I devoured with the attention and speed that I usually reserve for thrillers or detective novels), I, for one, was stunned by the productivity of this research organization during the 1970s. Quite apart from the windows-icon-mouse-pointer graphical user interfaces we take for granted on all our current operating systems, the laser printer, object-oriented languages, significant parts of TCP/IP, the predecessor to *PostScript*, and, of course, the world's first personal computer (note the lower case letters!) were all invented at PARC. Equally impressive are the luminaries of the digital age whose work came of age at PARC: Jim Clark invented the "Geometry Engine" in collaboration with PARC researchers and went on to found Silicon Graphics Incorporated; Charles Geschke and Chuck Warnock co-founded Adobe Systems, Inc., based on years of work at PARC; Alvy Ray Smith, co-founder of Pixar (makers of *Toy Story*, *Monsters Inc.*, and a spin-off of Lucasfilm), got his first introduction to computer graphics on PARC's color "Superpaint" machine in 1974; the list goes on.

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In the late 1960s, a cash-flush Xerox was just starting to lose its monopoly on the copier market. (At that time, the copier market was heavily "corporatized:" Xerox sold only large centralized copiers, and salesmen's remuneration was linked to the number of copies made by their clients). Xerox recognized that the nascent digital technology could potentially impact on their core business – although even the most far-sighted technology forecaster would have been hard pressed to imagine the revolution that would eventually ensue. Management of this traditionally East Coast corporation was persuaded to set up the new research center in what was just starting to be called Silicon Valley, initially to support a new computer subsidiary which Xerox had just purchased, but the center very quickly outgrew this mandate. The new center had an extraordinarily free hand to pursue basic research, which was not expected to impact on the mother company's investment for many years. Its charter included both the newly emerging computer-science and computer-engineering fields, as well as more traditional physical sciences. In the "buyer's marker" for outstanding researchers (following cuts in government spending as the Vietnam war dominated government attention and money, combined with an industrial recession), the center was able to attract top talent.

Michael Hiltzik's book does an excellent job of documenting the extraordinary creativity during the 1970s (the heyday of basic research at PARC), particularly the Computer Science Laboratory and the Systems Science Laboratory, the former under the charismatic and controversial Bob Taylor. The author focuses both on technological development – the Alto, probably the world's first personal computer (although never intended as more than a prototype); the laser printer; networking, and, of course, the graphical user interface – as well as the clashes of personality and corporate versus research culture that led to Xerox being frequently accused of "fumbling the future." (This is the title of another recent book on PARC, which is highly critical of Xerox). Hiltzik lays some myths to rest (one of the most persistent, namely that Xerox never made a cent out of PARC, is entirely untrue; its revenues from the laser printer alone have returned its investment many times over).

His conclusion is that Xerox could certainly have profited far more from the technology coming out of PARC than it did, but he goes on to question whether any company could have dominated digital computing, as Xerox was accused of failing to do. This will not satisfy strident critics of corporate America, but his history has a ring of rationality and balance, combined with a recognition of the complexity and unpredictability of the computer market. (The subsequent woes of two major hardware players in the personal computer market during the 1980s, viz. IBM and Apple, are well known). I would strongly recommend this fascinating book to anyone with more than a passing interest in the history of our digital present.

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Acoustics of Layered Media I: Plane and Quasi-Plane Waves, Second Edition, by L. M. Brekhovskikh and O. A. Godin, Springer-Verlag, New York, 2000, $59.95, x+242 pages, soft cover, ISBN 3-540-64724-4.

Acoustics of Layered Media II: Point Sources and Bounded Beams, Second Edition, by L. M. Brekhovskikh and O. A. Godin, Springer-Verlag, New York, 2000, $139.00, xv+524 pages, hard-cover, ISBN 3-540-65592-1.