Review of Fermilab: Physics, the Frontier, and Megascience by Lillian Hoddeson, Adrienne W. Kolb, and Catherine Westfall

dystopia, there is only one communication device that doesn't require messing around with a computer: a piano. The replicant Rachael plays it. But does she? As the film suggests, she is merely a cyborg delivering a code implanted in her brain.

At least it sounds good.

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Fermilab: Physics, the Frontier, and Megascience.

By Lillian Hoddeson, Adrienne W. Kolb, and Catherine Westfall.
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There is a section of the Old Testament (Nehemiah 3) that lists the various rebuilders of the wall of Jerusalem: "next unto them repaired Meremoth the son of Urijah, the son of Koz. And next unto them repaired Meshullam the son of Berechiah, the son of Meshezabeel. And next unto them repaired Zadok the son of Baana. . . ." And so on, for twenty-eight more verses. Not exactly riveting, but the author clearly felt these people should be remembered for what they built.

At times, *Fermilab: Physics, the Frontier, and Megascience* is reminiscent of Nehemiah. Scores of names appear briefly, with little further development. They are there to be chronicled, rather than to advance an argument. This can make for slow going, particularly in the opening chapters. Readers who expect the delightfully engaging, occasionally salacious tone of Lillian Hoddeson's earlier book, *Crystal Fire* (coauthored with Michael Riordan, and a winner of SHOT's Sally Hacker Prize), may be disappointed at first.

Part of the problem is that it takes six chapters for Fermilab to actually get built. Before that comes a convoluted shoving match among Brookhaven, Berkeley, Caltech, the Midwestern Universities Research Association, and the Atomic Energy Commission over the design of a "Truly National Laboratory" for high-energy physics. Then comes some seedy (but surely predictable) presidential and congressional wrangling over where to build the accelerator. Finally, Fermilab's eccentric and charismatic first director, Robert Wilson, arrives on the scene to build a cheap, no-frills, yet somehow majestic cathedral of science on the "frontier" thirty miles from downtown Chicago.

Wilson is an absorbing character, and his appearance injects excitement into the narrative. Still, Hoddeson, Adrienne Kolb, and Catherine Westfall leave unexamined how Wilson actually got people to carry out his vision. In one typical passage (p. 152), the accelerator staff have reached a dead end with no solution in sight, when Wilson walks in, reads a passage from the *Song of Roland* in medieval French, and the next day the problem mysteriously clears up. It's an amusing story, but I would prefer the authors to have

explained the construction and efficacy of Wilson's charisma, perhaps in the way that Charles Thorpe and Steve Shapin have done for Robert Oppenheimer or Donald MacKenzie has for Seymour Cray.

For historians of technology, *Fermilab* picks up quickly with chapter 7, "A Users' Paradise, 1968–1978." It's here that readers are reminded that Fermilab really is a technological artifact—an enormous, lived-in artifact that many different people use at the same time in vastly different, and ever-changing, ways. It is also, of course, a rather peculiar organization that coconstructs itself with that artifact. Both the artifact and the organization are centered on Batavia, Illinois, but are also distributed around the world. Bits of Fermilab are constantly being built in, or borrowed from, institutions on the coasts or in Europe or Asia. Individuals continually join in the work of Fermilab while retaining their affiliations with far-flung, and sometimes competing, organizations. The authors keenly describe the delicate dance between Wilson (and his successors) and the accelerator's users over the shape, duration, and purpose of their experiments. The result is a picture of user agency—sometimes frustrated, sometimes triumphant—that *T&C* readers will recognize.

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Hoddeson, Kolb, and Westfall reach an analytic denouement in tracing the mutual influence of budgetary constraints, technological and organizational momentum, and competitive pressures (among users and between accelerators). They argue that, by the late 1970s, cold war "Big Science" inflated into "megascience." Megascience was not necessarily bigger *in toto*. Indeed, the authors argue that declining budgets forced Fermilab management and users to pare down the total number of experiments, but to inflate the remaining projects to much greater budgets and timespans. Wilson's original vision of quick and dirty experiments was replaced by an era of a few large, slow-moving projects simultaneously competing and collaborating. It is an argument that has been hinted at elsewhere—for example in Harry Collins's *Gravity's Shadow* (2004)—but *Fermilab* compellingly articulates how the logic of megascience transformed high-energy physics and its accelerators.

Fermilab is necessary reading for anyone interested in the history of research technologies, large or small. It should also be relevant to anyone interested in the changing logic of large technological systems at the end of the cold war. And for those who built Fermilab, or those who want to remember them, this book is the authoritative account.

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