seem to be slipping away from them. Rather than a systematic study of menopausal symptoms, this is an exploration of ideas about menopause and how middle-aged Japanese women use them to redefine their status in urban and rural households.

Both the Lock and Rosenberger papers are fresh and insightful, but their placement at the end of this short volume does not quite work. The sudden narrowing of focus causes the volume to end abruptly, in an unsettled way. The volume might better have been fleshed out with two or three more case studies, perhaps on non-female issues to avoid the unfortunate final impression that "cultural" means "women's problems." There also would have been ample room here for a final essay by the senior editor, who does not appear as an author of any paper.

In short, this is a worthwhile book that leaves the reader wishing there had been a bit more at the end to fulfill the excellent promise of its beginnings. It is a good introduction to the subject for non-specialists, but also contains valuable new material for those already familiar with the work of this fine collection of social scientists.

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Computer Pioneers

The First Electronic Computer. The Atanasoff Story. ALICE R. BURKS and ARTHUR W. BURKS. University of Michigan Press, Ann Arbor, 1988. xii, 387 pp., illus. $30.

In the fall of 1941, shortly after receiving a doctorate in philosophy from the University of Michigan, Arthur Burks took a job as an instructor at the University of Pennsylvania's Moore School of Engineering. There, from 1943 until 1946, he worked on the ENIAC: "the world's first general purpose electronic computer," in his words. Alice Burks was also at the Moore School at that time, as a student and as a "computer": a person who used a mechanical calculator to prepare ballistics tables for the Army. (It was to compute these tables automatically that J. Presper Eckert and John Mauchly of the Moore School proposed building an electronic computer, which eventually became the ENIAC.) Arthur Burks's contribution to the ENIAC included checking the logical consistency of its design and developing the structure of its programming unit. He also was responsible for taking notes at design meetings and for preparing periodic progress reports. Thus it would be hard to find two persons better suited to write a story of that computer's invention.

But the title of this book refers not to the ENIAC but to another computer, one with which neither Arthur nor Alice Burks had direct experience, and of the details of which they learned only many years later. This book is about a computer built by John V. Atanasoff at Iowa State University between 1940 and 1942. It is the authors' goal to demonstrate that Atanasoff's machine, not the ENIAC, was the "world's first electronic computer" (albeit not "general purpose") and that it was from Atanasoff's work that the ENIAC grew, by a direct transfer of key concepts of computing principles and of electrical engineering.

A case for Atanasoff's priority has already been made, indeed literally so: in 1973 a federal court decided that a patent on the ENIAC was invalid, mainly on the basis of Atanasoff's work. But according to the authors, historians of computing have not accepted this verdict and continue, wrongly, to credit Eckert and Mauchly as the inventors of the computer. And although attorneys for both sides of the patent dispute assembled enormous quantities of documentary material on the ENIAC's history, scholars have not gone to these sources in writing the history of computing and so repeat the errors of an earlier generation of historians. Burks and Burks felt compelled to write this book, then, to call attention to what those sources reveal and to interrupt the flood of bad history before it digs a channel too deep to alter.

The authors have drawn on these materials; in making their arguments they cite both the documentary evidence gathered for the trial and the transcripts of the witnesses' testimony. To my knowledge, other scholars have not drawn on this material as they have, although it has been available for some time. The authors' diligence and energy in going to these sources, which they supplement by an extensive correspondence with Atanasoff himself, more than compensate for the fact that they were not direct participants in this part of the story. (Mauchly died in 1980, before Burks and Burks began working on this book. Their relationship with Mauchly's widow, Kathleen Mauchly, and with Eckert has been strained and lacking in cooperation. An appendix to the book discusses Mrs. Mauchly's response to an earlier presentation of this book's thesis, followed by a response by the authors.)

What Burks and Burks do establish is that Atanasoff conceived and partially executed a design for a partially electronic calculator, which was startlingly original and ingenious. It was not a general-purpose computer but was optimized for the solution of systems of linear equations. At least one operation—a division—had to be done off-line by hand to solve a problem, so it was far from automatic. The machine used electromechanical devices for timing and number storage, but its arithmetic circuits were wholly electronic. Indeed, for its arithmetic unit Atanasoff invented "the first electronic circuit of any complexity" (p. 20). At the same time it lacked the ability to multiply (or divide), a limitation that the authors feel does not prevent their calling the machine a "computer" but that nonetheless indicates a low level of sophistication. Atanasoff stopped work on it in the fall of 1942, at which time the machine was essentially complete but not working reliably enough to do the kind of work solving physics problems for which it was built.

Relying again on trial evidence and subsequent correspondence with Atanasoff, the authors further establish that Mauchly had made very little progress toward the realization of his own desire to build a computer prior to his visit to Iowa in June 1941. During that visit, as Atanasoff's houseguest, Mauchly examined the machine in great detail, and he conversed at length with Atanasoff on all aspects of computer design and engineering. Upon his return to Philadelphia, Mauchly set in motion the steps that led to the creation of the ENIAC, which was finished in 1945 and did useful work from 1946 until its dismantling in 1959.

In their discussion of this visit and its aftermath Burks and Burks accuse Mauchly of unethical, unpatriotic, and unprofessional behavior. But their case for this is weak, and the book suffers from the stridency of these arguments. Atanasoff hid his invention under a bushel; Mauchly was a promoter. Atanasoff's technical virtuosity could not overcome the resistance to the radical idea that electronic digital computing was in 1940. Mauchly collaborated with J. Presper Eckert, a man whose engineering abilities were as good as Atanasoff's; both Eckert's and Mauchly's abilities were needed to bring the ENIAC into being.

There is merit in the author's criticism of scholars for not using the trial transcripts and related materials to shed light on this important story. But their contention that historians have been too kind to Mauchly is simply not warranted. Neither is it true that historians have ignored Judge Larson's verdict or dismissed it as irrelevant. I cannot share the surprise, chagrin, and bitterness at what Burks and Burks feel is a deliberate shirking of responsibility by historians of computing.

They say that historians "strangely" do not accept Judge Earl Larson's judgment, despite the evidence gathered, despite the high legal standards that Judge Larson applied to his conduct of the trial, and despite the fact that Sperry Rand (holders of the invalidated patent) did not appeal the verdict. The judgment of the court *is* relevant to any discussion of who invented the computer; a glance at nearly all the scholarly histories written in the past few years shows at the very least that scholars have given it some weight. But what constitutes a "fact" as historians accept it is very different from what a court of law accepts. The Burks acknowledge this, but they do not accept it.

What is most regrettable about this book is that it weakens Atanasoff's case by trying to make his contribution seem greater than it was. Atanasoff should be judged on the machine that he built. It was one of the first machines to use the speed of electronic components to solve complex problems not solvable by manual methods. This was quite an achievement, one that historians have gradually come to recognize and credit him for. Its influence on the ENIAC does not change what it could or could not do. Above all, it is unfair to judge Atanasoff, as Burks and Burks do, on the basis of what he "might" have done, had circumstances (that is, his transfer to other war-related work in the Washington, D.C., area) been otherwise. Perhaps he and his assistant Clifford Berry might have worked out the few remaining bugs in their computer; perhaps Atanasoff could have inaugurated the modern "computer revolution" directly, instead of via the ENIAC and the Moore School. But he did not, and that is a fact that Alice and Arthur Burks seem unwilling to accept. As I said, the book does not suffer from the fact that neither Arthur nor Alice Burks knew Atanasoff at that time, owing to their diligent and careful research. But the fact that neither author is a historian by training is a more serious problem, as their treatment of this theme makes evident.

The authors clearly would like this book to settle the issue of who invented the digital computer "once and for all." Unfortunately that is not to be. Their analysis of Atanasoff's work and and his link to the ENIAC project is an important piece of the mosiac of early computer history. But their argument about Mauchly's role and their accusations of unethical behavior on his part are way off the mark and will have the effect of obscuring the truth, not clarifying it. That is a shame, because it mars what otherwise is a fine piece of work.

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Immune Regulation

Recombinant Lymphokines and Their Receptors. STEVEN GILLIS, Ed. Dekker, New York, 1987. xxviii, 325 pp., illus. $89.75. Immunology Series, vol. 36.

The study of lymphokines (perhaps "cytokines" is a better generic term) is an area in which data accumulate so quickly that it is virtually impossible for a book to be current even at the time of publication. Thus, as Gillis notes in his thoughtful preface, such a book is only "a still life of the field of immune regulation at a given point in time—unfortunate only in that the field has continued to move at its rapid pace." Nevertheless, I believe that this book provides a comprehensive review of a large number of topics and serves as an excellent resource for either a student or an established investigator. The chapters are generally well written for a diverse audience and well referenced. They treat interferon, interleukin-2 and its receptor, interleukin-1 and its receptor, interleukin-3, erythroid-potentiating activity, granulocyte macrophage colony-stimulating factor, immunoglobulin E–binding factor genes, interferons, tumor necrosis factor, and lymphotoxin.

Although it encompasses a large number of the known factors, the book is not, nor does it claim to be, comprehensive; it omits detailed discussions of other cytokines such as interleukin-4 and interleukin-6. The depth of detail varies from chapter to chapter, and there is a tendency for some of the authors to overemphasize their own work rather than summarize the overall field. For example, in the chapter on the human IL-2 receptor, the authors state that "purification of the IL-2 receptor was made possible by the generation of a monoclonal antibody, termed 2A3," an antibody that they identified, but they do not mention monoclonal anti-Tac antibody, described by Uchiyama *et al.* in 1981 and generally considered the prototypic anti–IL-2 receptor antibody. The chapter on the murine IL-2 receptor focuses exclusively on complementary DNA cloning and omits the extensive biochemical characterization published in the literature. Nevertheless, both of these chapters are compendiums of important information.

I found the chapter on the proIL-1β gene by A. Webb, L. Rosenwasser, and P. Auron especially interesting. Among other topics, it very nicely reviews the structural similarities of the amino acid sequences and of the genomic organizations of IL-1α and IL-1β, as well as the data suggesting that the IL-1β gene represents an active retroposon derived by duplication of the IL-1α gene. The authors also discuss the regulation of IL-1β gene expression. S. Dower provides an excellent chapter on the IL-1 receptor wherein he summarizes elegant kinetic binding data of IL-1α and IL-1β to the IL-1 receptor and provides a detailed summary of the cellular distribution of IL-1 receptors. *Recombinant Lymphokines and Their Receptors* is a valuable resource that summarizes a large quantity of data in a generally clear and concise form, and as such it represents an extremely useful "still life" of the field.

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Techniques for Ecologists

Developments in Numerical Ecology. PIERRE LEGENDRE and LOUIS LEGENDRE, Eds. Springer-Verlag, New York, 1987. xii, 585 pp., illus. $149.70. NATO Advanced Science Institutes Series G, vol. 14. From a workshop, Roscoff, France, June 1986.

If you bring together a dozen experts on a range of numerical techniques with three times as many ecologists for a week in a cool and windy marine station, what would you expect? Well, what has resulted here is a series of interesting, individual, accounts of a diverse set of techniques, supplemented by a short series of inadequate responses from the ecologists, guessing about the usefulness of the techniques. The reason for such a response is simple. Just discussing new, computer-based, conceptually difficult techniques is no basis for deciding if they are useful. They must be shown to be useful in a variety of data sets, and then tried on your own data, on your own computer system, before you can say whether or not a particular technique is helpful in understanding a particular type of problem.

So, in my view, this book is best regarded as a source of various advanced and unusual techniques of data analysis, of use in a great variety of sciences, not just ecology. On the whole, the accounts are not intended to be comprehensive or exhaustive; this is not a textbook. On the other hand, the techniques that are described are, usually, given in some detail so that they could be used efficiently once computer programs had been acquired, or modified, or written.

The distribution of space devoted to topics starts geometrically, ends up J-shaped. The relative lengths are difficult to judge, as each paper is produced on the author's own printer, giving an unusual variety of type sizes and legibility and inducing a jaundiced glance at the price. There are