albeit a very public one—of a more general, indeed pervasive, problem in science.

After reading the book, I asked myself what has changed with respect to cold fusion since it was written. The answer must be, not much. Public presentations on the topic tend to fudge experimental details, give only partial results or results taken out of context and adduce relationships between unrelated experiments while glossing over inconsistencies. It seems to me that in their desperate need to attribute phenomena to the existence of a nuclear effect, the proponents of cold fusion have failed to distinguish in their results what is real from what is imaginary, and they might indeed be missing an interesting chemical or metallurgical phenomenon; there may in fact exist in the palladium–hydrogen system, under circumstances that remain ill-defined, a release of stored energy as heat. Indeed, it is important to say that there do seem to be some good measurements which indicate the possible occurrence of an interesting phenomenon. But what profit is there in such an inefficient, unreliable, dangerous and expensive energy storage method?

Albert Einstein, Mileva Marić: The Love Letters

Edited by Jürgen Renn and Robert Schulmann (translated by Shawn Smith)
Princeton U. P., Princeton, N. J., 1992. 107 pp. $14.95 hc
ISBN 0-691-08760-1

In 1986 the editors of Einstein's collected papers were given access to papers from the estate of Albert's older son, Hans Albert; the papers had been deposited in a vault in a San Francisco bank. There they found some 400 letters exchanged among Einstein, Mileva Marić, his first wife, and their two sons. Nearly all of the 54 letters exchanged between October 1897 and September 1903—43 written by Albert, 11 by Mileva—have appeared in the original German in volume 1 of Einstein's collected papers (Princeton U. P., 1987); the remainder will be included in later volumes. These 54 early letters form the substance of the book edited by Jürgen Renn and Robert Schulmann, who are coeditors of the Einstein papers, and, therefore, thoroughly familiar with the period in which the letters were written.

In this book the letters appear in English, having been ably translated by Shawn Smith. The translation has the advantage of being accessible to a larger audience, even though some of the original flavor inevitably is lost. Substituting "dollie" for *Doxerl* or "kitten" for *Miezchen*, Albert's amorous Swabian names for Mileva, or "Johnnie" for *Johonsel* (Mileva to Albert) cannot quite convey the same feeling as the original.

Mileva, of Serbian descent, was born with a luxation of the hip joint; she limped all her life. In 1896 she met Albert, four years her junior, shortly after both had enrolled at Zürich's Federal Institute of Technology (where both were aiming for a degree to become high school teachers in mathematics and physics). They married in January 1903, separated in 1914 and were divorced in 1919, the year Albert remarried.

The letters in this book mainly cover the period of their courtship. They speak of love. Or do they? Rather, it seems to me, they show Einstein as a "soul in ferment, the character undecided. . .thence proceeds mawkishness," words taken from the book's perfectly chosen epigraph. I do not believe that Einstein was capable of love for either of his wives. As he himself wrote shortly before his death, he had twice "failed miserably" in marriage.

Albert also writes to Mileva about his parents' vehement opposition to their relationship. Perhaps most interesting are his enthusiastic accounts of his research and his ideas for future work, in which relativity is prefigured, and Mileva's responses, which show her genuine interest in these thoughts. These accounts predate Einstein's inventive outbursts of 1905, outbursts that marked the beginning of his meteoric career.

In recent years much nonsense has been written about Mileva's helping to create relativity theory. I should stress that neither in these letters nor later did Mileva herself ever make such claims.

A letter from May 1901 reveals a fact that startled all Einstein experts: Mileva was pregnant. In January 1902 she gave birth to a daughter, Lieserl. When the letters were made public, that news made the *New York Times* on 3 May 1987, which carried a front-page article under the headline "Einstein Letters Tell of Anguished Love Affair." It obviously became an obligation for the editors of the Einstein papers to find out what had become of that girl. To date all those serious efforts have failed. No mention of Lieserl appears in any letter after 1903.

After their marriage, the Einsteins had two sons, Hans Albert and Eduard, who of course do not appear in this book. Neither does this collection tell the story of Mileva's later life, a tale of misfortune and despondency.

How important are these letters for an understanding of Einstein? I leave it to the reader to make up his or her mind. The handsomely produced, slim volume with its beautiful dust jacket would make an ideal gift.

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Route 128: Lessons from Boston's High-Tech Community

Susan Rosegrant and David Lampe
Basic Books, New York, 1992. 240 pp. $25.00 hc
ISBN 0-465-04639-8

Job creation and business expansion are the objects of much attention today. *Route 128*, named for the Boston highway that is home to many of the region's high-tech industries, offers abundant material for those interested in these topics. Perhaps a better title would be "A History of Commerce and Education in Massachusetts from Earliest Times to the Present." The authors give a historical overview stretching back to the 19th century and before, providing much to explain the attitudes, circumstances and experiences that shaped the state's high-tech expansion.

The book belongs to the genre of journalism. The authors interviewed many key participants and wove their story into a mostly chronological narrative of how the region's prosperity of the 1980s had its roots in the MIT Radiation Laboratory of World War II and the developments that flowed from it. Largely absent are the tables, charts and graphs so prized by economists and scientists.

I read with interest that prior to World War II MIT encouraged its faculty to spend up to 20% of their time on consulting. I doubt if any dean of engineering (let alone science) would encourage that arrangement today, and many professors would begrudge the time taken away from publishable (that is, bankable, in academic terms) research. But perhaps it is an idea worthy of reexamination in the post-cold war age, when expansion of the US economy in the face of international competition is widely viewed as a national goal.

The authors deal at some length with the role of universities in both

creating new knowledge and training people. A prestigious research university is clearly a key to the kind of high-tech prosperity that Massachusetts enjoyed in the mid-1980s, but it is only a necessary, not a sufficient, condition. While Harvard is perhaps the most famous university in the US, one infers from the book that its role in high-tech growth was small and that engineering-oriented MIT was the more significant ingredient.

As the title implies, the book is focused very strongly on the Boston area. And readers from other places may find the Massa-centric viewpoint somewhat grating. But it would have been interesting to see comparisons with other areas of the country that have enjoyed high-tech booms, such as Silicon Valley, the Long Island–New Jersey area or southern California (with Caltech and the Jet Propulsion Laboratory).

Route 128 will make interesting reading for planners, economists, academic researchers, politicians, historians and venture capitalists.

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Basics of Interferometry

P. Hariharan
Academic, San Diego, Calif., 1992. 213 pp. $39.95 hc
ISBN 0-12-32518-0

Basics of Interferometry is a good introduction for scientists and engineers who understand basic optics and need to use interferometry or interferometers. This book packs a lot of information into a short volume. The descriptions provided by P. Hariharan are concise and easy to understand. In addition, he provides illustrative examples for major concepts, and to help solidify the concepts he includes problems with detailed answers.

The topics discussed include basic interference, two-beam interferometers and multiple-beam interference, as well as light sources and detectors. Hariharan introduces various applications of interferometry in sections on the measurement of length, optical testing, digital interferometry techniques, holographic and speckle interferometry, interferometric sensors, interference spectroscopy and Fourier-transform spectroscopy. For each application the author describes a specific interferometer configuration. Each section of the book also provides practical advice to help the reader decide which technique is best for a given application. Hariharan also discusses whether to buy or build an interferometer. The last 50 pages of the book are appendices that provide good references on basic concepts, interferometer adjustment and the evaluation of interferograms.

Hariharan has extensive experience in interferometry, optical testing and holography and is well qualified to write a book of this type. Although he has written more detailed books on interferometry and holography, this book is the most useful one for those who work with interferometers. Because this book is not geared toward the specialist, it can serve as the text for an introductory course in interferometry. It can also serve as a good reference.

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Active Control of Sound

P. A. Nelson and S. J. Elliott
Academic, San Diego, Calif., 1992. 436 pp. $129.00 hc
ISBN 0-12-515425

The idea that noise may be reduced by machine-made silence is no longer confined to science fiction. The first patent for a "process of silencing sound oscillations" was granted to Paul Lueg in 1936, some 20 years before its time. By 1953 electronics had developed to the point where the construction of an "electronic sound absorber" was feasible. By 1970 several elaborate schemes to suppress sound electronically were invented, and by 1980 these schemes were realized in high-technology practice, a practice made possible by the phenomenal advance in digital electronics. After a faltering start, commercial developments in active sound control are occurring now—described in publications too often aimed at promoting commercial positions rather than scientific advance. There has been an explosive growth in the number of papers published and the variety of examples reported, but there has been no authoritative reference text on active sound control—until now. Phil Nelson and Steve Elliott, who have been responsible for so many of the subject's successful technical advances, have written a most important text, which brings both the underlying theory and practical technique within clear reach of their intended audience: students in acoustics and signal processing, professional acoustical and electrical engineers and researchers studying active sound control.

Active techniques bring to noise control a new order of scientific method. They are different from—and will enhance rather than displace—passive technology, which includes avoiding the overlap of modal frequencies, damping out any resonances and eliminating rattles, noise shorts and obvious sources of vibration. Current passive techniques concern incoherent sounds, whose energies add to the noise of the whole. But active methods exploit interference between coherent sounds, with the controller working to maintain the strength and phase for destructive interference. Energy addition of incoherent sounds has no relevance to this case, and there is nothing to justify the intuitive expectation that two sounds are louder than one; when precisely matched, they cancel each other.

The subject has little room for approximate procedures and loose thinking. Errors quickly destroy the delicate cancellation. As a subject active sound control has much in common with applied mathematics, precision and rigor being essential to both fields. The theoretical side of acoustics and the control branch of electrical engineering are the subject's core disciplines, and it is a good feature of this book that its first quarter is devoted to familiarizing the student with the essential notions of both. The authors do this by treating simple special cases in great detail (implying a generality beyond what is strictly justified) and by giving references that provide proof that practical cases display the same underlying features. This approach encourages the use of these ideas in practical situations too intricate for comprehensive analysis. And although the extrapolation will occasionally fail, the number and variety of successfully treated cases justify the approach. The book certainly introduces the main concepts in a clear and concise way.

The authors treat sound as pressure variations linearly related throughout space and time to prescribed source activity and boundary conditions. Transducers monitor the sound and produce the signals to be processed for driving the secondary sources that generate the canceling field. What is feasible within the causality constraint is the main question addressed under the heading "Linear Systems". The summary of digital filter design and scope that concludes the basic material in this section enables one to understand the workings and construction of reported active sound suppressors. The main material of the book follows this introduction, giving theoretical con-