study, in which the bacillus of plague was, it seems, definitively identified as the causal organism. The geopolitical context of the outbreak is set out in loving detail, from the precise location and local management of the crucial elements of the Manchurian railway system (Russia, China, and Japan each controlled a portion of the relevant line) to the desire for access to ice-free ports on the Pacific. This was the legendary "Manchurian Question" that complicated responses to the outbreak and set the scene for contrasting exemplars of national and local efficiency in epidemic response. The two central chapters of *The Great Manchurian Plague of 1910–1911* trace the course of the outbreak and responses to it and dissect the convening and proceedings of the International Plague Conference of April 1911. By February 1911 it was clear that China, mistrustful of the intentions of both Russia and Japan, was unable fully to manage its end of the epidemic. The conference was the means by which the Great Powers sought to manipulate China into accepting international help, and it resulted in new initiatives being developed in Manchuria by both China and Japan, the former embarking on a public health program, the latter establishing a new medical school. In the penultimate chapter Summers tracks the origins of the epidemic in the rapid expansion of the marmot fur trade, carefully detailed, which disturbed the local disease ecology, and performs a final scientific sleight of hand by invoking modern bacteriological research on plague biovars to pin down Central Asia as the likely source of the 1910–1911 epidemic. The theme of disease ecology and international response reappears in the closing pages of the book, where Summers considers modern approaches to this issue.

Lucidly written and eminently readable, this small book casts light on the complex circumstances that may complicate international responses to major epidemic outbreaks. It reads, however, more as a presentation of various facets of the epidemic than as a sustained analysis and may leave the reader struggling to align the whole—and with the uneasy feeling that geopolitics has trumped medical science.

ANNE HARDY

■ Recent (1950–)

Andrea Cappelli; Elena Castellani; Filippo Colomo; Paolo Di Vecchia (Editors). *The Birth of String Theory*. xxv + 636 pp., illus., apps., index. Cambridge: Cambridge University Press, 2012. $99 (cloth).

The Birth of String Theory is a voluminous compilation of reminiscences, often technical, by physicists who contributed to the making of the first relativistic string theories in the period 1968–1984. The reminiscences are complemented by substantial introductions by the editors to each part of the volume. Appendixes provide further technical details. In part (and as noted in the preface [p. xxii]), the book takes the form of a historically inspired textbook of string theory. As such, it is geared more toward physics students and researchers than toward historians and philosophers of science. From the various contributions to the book, however, there gradually emerges the story of a remarkable development in theoretical physics that can be appreciated at different levels of technical detail and that is also interesting from a historical and philosophical point of view.

The story begins in 1968 with a theoretical proposal by Gabriele Veneziano. It was supposed to be a description of the scattering of strongly interacting nuclear particles (called "hadrons"). Further development revealed, however, that one was actually dealing with a theory of relativistic strings, and different versions and generalizations of it were proposed. It also became clear that, as theories of hadrons, the proposals faced insurmountable difficulties.

Among other problems, any of the early variants of string theory implied the existence of particles ("tachyons") that would propagate faster than light, as well as the existence of massless particles with spin one and two. None of them was seen in the hadronic experiments. This discrepancy between theory and experiment led almost everyone to abandon work on string theories. Yet some, as John Schwarz recalls, were convinced that "[the string theories] ought to be good for something" (p. 47; see also p. 499), and these people continued to explore the properties of the theoretical proposals as well as devising further variants.

In 1974, Schwarz and his younger collaborator Joël Scherk realized that if the strings are taken to be smaller by several orders of magnitude than initially proposed, string theories turned out to be promising candidates for "Einstein's dream" (p. 499): a theory that would unify the forces that are relevant for particle physics with the gravitational force.

However, these and other remarkable results were not enough to bring string theories back into the mainstream of theoretical physics. Only with the proof, by Schwarz and Michael Green, that in supersymmetric string theories violations of symmetry requirements due to quantum effects ("anomalies") cancel each other out did the string theories become the most promising candidates for a unified theory. "The transition was abrupt" (p. 525), and by 1985 string theories had again become an active field of research, with many physicists and a great deal of funding dedicated to it.

The firsthand accounts presented in *The Birth of String Theory* provide rich material for research in the history and philosophy of science and also mention further resources, such as unpublished notes, research reports, and preprints (see, e.g., pp. 199, 256, 266). Topics a historian or philosopher of science could address include the characterization of theories and models and their relation to experimental data, knowledge transfer between theoretical physics and mathematics, diagrammatic and analogical reasoning, research networks and collaborations, and funding and career considerations, to name but a few. In fact, Elena Castellani, one of the editors and the only contributor who is not a string theorist, addresses some of these; she also raises further philosophical topics and begins a more reflective account of the "birth of string theory." Still, most of the genuine research into the history and philosophy of string theory remains to be done.

The book is thus similar in aim and scope, and also in achievement, to the series Laurie M. Brown and Lillian Hoddeson have edited on the beginnings and development of particle physics in the period 1930–1970: *The Birth of Particle Physics* (1983), *Pions to Quarks* (1989; edited with Max Dresden), and *The Rise of the Standard Model* (1997; with Dresden and Michael Riordan), all published by Cambridge University Press.

I wonder why more philosophers and historians of science were not included as contributors to the volume (and participants in the meeting that gave rise to it). After all, Brown and Hoddeson considered such underrepresentation a shortcoming of their volume dealing with the birth of particle physics (*The Birth of Particle Physics*, p. 4) and corrected it in the two subsequent volumes. But it is by no means too late to begin historical and philosophical reflection on the development of string theory. Rather, this book is a timely invitation and a solid starting point for such an enterprise.

ADRIAN WÜTHRICH

Paul E. Ceruzzi. *Computing: A Concise History*. xvi + 176 pp., illus., bibl., index. Cambridge, Mass./London: MIT Press, 2012. $11.95 (paper).

Paul Ceruzzi previously wrote a well-regarded academic history of computing, *A History of Modern Computing* (MIT, 2003). Now he has written *Computing: A Concise History*, part of the MIT Press Essential Knowledge Series, which promises "authoritative material on topics of current interest in a form accessible to nonexperts" (p. viii). The book is short but covers a wider domain than Ceruzzi's previous work, including the prehistory of computers. Ceruzzi approaches this difficult task of summary by framing the history in terms of four perennial themes: the digital paradigm, convergence, solid-state electronics, and the human/machine interface.

The digital paradigm refers to the encoding of information, control, and computation into discrete binary elements, encompassing everything from software to digital music such as MP3s. Convergence refers to how computers come to incorporate ever more features from diverse technologies; thus the smart phone integrates phone, camera, and digital assistant in a computer-controlled device. The theme of solid-state electronics refers to the inexorable advance of electronics: ever smaller, faster, and cheaper devices. Ceruzzi epitomizes this as Moore's law, seeing a possible case of technological determinism, technology driving history. Finally, the human/machine interface includes both particulars of user controls and questions as to whether computers are designed to replace, extend, or adapt human capabilities.

The narrative proceeds roughly chronologically. The first chapter, "The Digital Age," outlines the history of nineteenth- and twentieth-century technologies and activities that would go on to define computing as Ceruzzi understands it, including telecommunications. The second chapter, "The First Computers, 1935–1945," focuses on the machines and ideas that lie on the indistinct boundary between simple calculators, simple control mechanisms, and the modern computer. The third chapter, "The Stored Program Principle," deals with programming in various guises. The fourth chapter, "The Chip and Silicon Valley," treats the rise of silicon chips and Silicon Valley in the 1950s and 1960s. The fifth chapter, "The Microprocessor," describes the scramble by hobbyists and tech-savvy entrepreneurs to develop early personal computers and outlines preexisting computer firms' struggles to adapt. The sixth chapter, "The Internet and the