The Real Edison

The Papers of Thomas A. Edison. Vol. 1, The Making of an Inventor, February 1847–June 1873. REESE V. JENKINS *et al.*, Eds. Johns Hopkins University Press, Baltimore, 1989. lxviii, 708 pp., illus. $65.

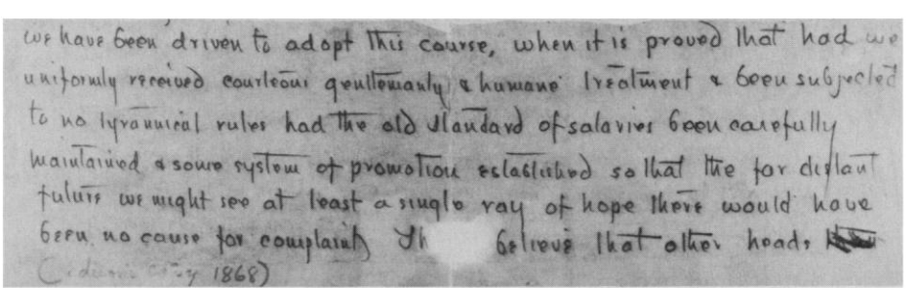
In the pages of this volume Edison the man, his work, and his times come alive. This is the first of 20 forthcoming volumes documenting the life of America's most celebrated inventor. Scholars have eagerly awaited it; and it should also engage research managers, policy-makers, and anyone interested in the process of technological innovation. Students of creativity, especially those searching to surpass retrospective accounts that accent the inscrutability of genius, will find a treasure trove. All readers will find Edison in action, by volume's end a lively 26-year-old inventor of stock tickers used along Wall Street and of telegraphs used up and down the Eastern seaboard. But in two ways the Edison of this volume must revise the Edison we have enshrined as a cultural hero.

This volume renders untenable the popular view of Edison as a Merlinesque figure who wrestles with mysterious forces and singlehandedly conjures up stunning inventions. It is not to slight Edison's creativity to note that he took inspiration from colleagues and, sometimes, direction from financial backers including Western Union. Indeed, what stands out is Edison's blending of technical creativity with commercial opportunity. Of Boston he observed, shortly after moving from that city to New York to launch into full-time invention, "I cannot make money there and we should be farther than ever from the solution of this interesting problem" in printing telegraphy (p. 127). Similarly notable is Edison's management of inventive and manufacturing activities, sometimes, to his distress, simultaneously. Sketch after sketch from his laboratory notebook directs an assistant to construct experimental telegraph circuits. And as his telegraphs and stock tickers entered the financial houses of New York and London, the imperatives of manufacturing came to the fore. At one moment, we find Edison, now in Newark, overseeing five establishments and managing 150 skilled workmen. Already he had assembled part of the team that would soon embark on electric lighting.

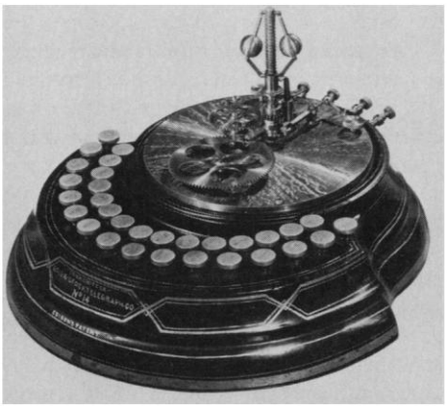
This volume also calls into question the view of Edison as the quintessential "Edisonian" inventor, an uneducated tinkerer who spurns science for endless hours of aimless cut-and-try testing, somehow being led by luck, pluck, and virtue to inventions that revolutionize the world. Rejecting the myth of mindless empiricism, the editors discern elements of Edison's "method" of invention. They draw attention to his thinking spatially, visually, and analogically as well as his assembling a repertoire of electromechanical elements. Polarized relays reappear in design after design; ratchet-and-pawl escapements devised for printing telegraphs appeared later in his motion picture mechanisms. Edison's modest education, driving ambition, and scientific attainments are clearly in view. Edison was a careful reader of Michael Faraday and of the American, English, and German technical literature on telegraphy as well as an often witty writer. Voltaire, he corrected a fellow telegrapher, did not invent the Voltaic pile. Edison had grasped current scientific knowledge, despite his own efforts in later years to disparage it. Electromagnetic induction and saturation were key to his single-wire printing telegraphs. Achieving rapid and readable automatic telegraphy required careful balancing of resistance, capacitance, and induction. His quadruplex telegraph relied on Wheatstone bridges as much as on sophisticated mechanisms. How changed would be our view of "Edisonian" invention if he had completed a projected book on telegraphy and electricity! With Edison as the unit of analysis, the separate spheres of "science" and "technology" collapse. Research managers and science policy-makers take note.

This volume trades a simplistic view of Edison and invention for a rich portrait of a complicated man and a complex process. Intriguing themes abound. The process of inventing and patenting revealed here should fascinate economists who count patents, patent lawyers who file them, and inventors who make them. Edison typically followed the classic formula of filing a preliminary caveat, drafting an application, adjusting its claims with patent lawyers, gaining a patent, then negotiating with prospective backers. But sometimes he sold hundreds of novel machines before a patent application was even drafted. In several cases, including Western Union's "patent intricacy" of duplex telegraphy, his backers committed him to invention on command: they specified the technology's desired characteristics, Edison then invented it. Though his inventive activity flourished, these conditions rankled. Equally intriguing are the failed inventions, the will-o'-the wisps like his facsimile machine conceived to transmit Chinese characters via telegraph wires. Throughout, a very human Edison shines through. An 1872 notebook entry closes simply: "Mrs Mary Edison My wife Dearly Beloved Cannot invent worth a Damn!!" (p. 449).

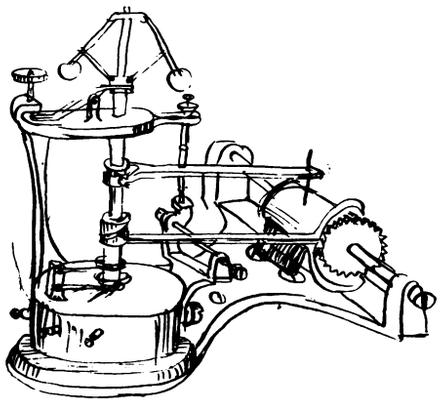
The volume as a whole is a delight to browse through or to read carefully. A quick glance reveals hundreds of sketches from notebooks, letters, and patent applications. These I found more comprehensible than the photographs of patent models and production machines. Introducing each of the 12 chapters are informative headnotes that together offer a 55-page biography. A closer reading brings into focus letters to Edison's parents and agreements detailing his contractual relations, as well as the notes and diagrams that detail the rhythm of his days.



Newspaper copy transcribed by Edison in the Western Union office in Boston (1868). While he was a press-wire operator "Edison had made a deliberate effort to perfect the art of taking clear and rapid copy by writing small and disconnected letters. One evening the night manager at the Boston office discovered that none of the press report was usable 'for the reason that Edison had copied between fifteen hundred and two thousand words of stock and other market reports in a hand so small that he had only filled a third of a page.' " [From *The Papers of Thomas A. Edison,* vol. 1]



Transmitter for printing telegraphs constructed at Edison's shop in New York (around 1871), embodying Edison's U.S. Patent 131,343. [From *The Papers of Thomas A. Edison*, vol. 1]



Edison's drawing of one of his versions of a machine for facsimile telegraphy, which number among his unsuccessful inventions (1871). [From *The Papers of Thomas A. Edison*, vol. 1]

Chronologically ordered, the carefully annotated but literally transcribed documents allow Edison to speak for himself. Edison the telegraph operator writes meticulously and spells accurately. Later, Edison the inventor rushes headlong to jot a note or sketch a new idea, skipping punctuation and abbreviating like mad. Even more so than in letters, Edison comes alive in his drawings and diagrams, and the volume accomplishes the difficult feat of explaining their technical details in clear, accurate, and understandable language. This volume's 340 documents, autobiographical notes, list of patents, and scholarly apparatus will satiate most readers; yet more exists. When complete, the 20-volume book version of the Edison papers will total just 0.2 percent of the 3.5 million pages of archival material available at the Edison National Historic Site in West Orange, New Jersey. A recently published microfilm version representing 10 percent of the archives stands intermediate. References in the book version point to the microfilm version and from there to the archives themselves. With the book version of the Edison papers, Reese Jenkins and his staff have gracefully combined the detail that scholars demand with the accessibility that we all enjoy. Its irresistible subject, and surprisingly reasonable price, will appeal to a wide readership.

THOMAS J. MISA
Department of Humanities, Illinois Institute of Technology, Chicago, IL 60616

Something New Under the Tsars

Darwin in Russian Thought. ALEXANDER VUCINICH. University of California Press, Berkeley, 1989. x, 468 pp. $45.

Darwinism was introduced promptly into Russia and was received with enthusiasm. According to Alexander Vucinich its welcome was due partly to excellent timing. It arrived shortly after the triumph of the "Westernizers" over the Slavophiles in the aftermath of national defeat in the Crimean War. The Westernizers were promoting modernization in many forms: technological, scientific, economic, and philosophical. Darwinism appeared as the newest and most spectacular fruit of Western science, and probably encountered less entrenched resistance than in any other major European country. Several Russians gained international recognition almost immediately as major contributors to evolutionary science—for example, A. O. Kovalevskii and I. I. Mechnikov as pioneers in evolutionary embryology, and V. O. Kovalevskii in evolutionary paleontology—and others were to follow.

Vucinich has conceived this book as both a chronicle of the emergence and development of evolutionary biology and related sciences in Russia up to the end of the tsarist period and an account of the impact of these developments on Russian social thought (including philosophy, theology, and popular literature). Though this complex mosaic of intellectual history would be slow going for a reader not already acquainted with the history of science or of Russian culture, Vucinich has generally kept his subject matter under firm control.

Some of the distinctive features of the history of Darwinism in Russia that Vucinich points out were a near total absence of Social Darwinist thought, a significant degree of skepticism concerning the prominence accorded by Darwin to the Malthusian struggle for existence, and, later on, a reluctance to recognize the importance of (and promote) work in experimental genetics. That reluctance may be explained by two other characteristics of Russian Darwinism to which Vucinich refers: the persistent influence of Lamarck on most Russian Darwinists, and the institutional dominance of a strict Darwinist orthodoxy that was loath to de-emphasize natural selection in favor of any form of "autogenesis" in explanation of species transformation.

Vucinich's narrative proceeds not in the manner of an artificially smoothed retrospective summary of the rise of certain theories and branches of scientific inquiry (and the demise of others), but by representing the work and thought of a panorama of individual scientists and writers who were collectively responsible for these developments, the outcome of which seldom coincided very neatly with the research programs and paradigms of any single participant. Told from this perspective, the story of the rise and fall of various theories and sciences is still discernible, but only through the intrinsically ambiguous detail of the clash of numerous interpretations of Darwinism by a large number of interested parties who often had only partly compatible research motivations and assumptions. And of course the implications of Darwinism were also subject to development through time as new findings and new research strategies arose in a number of related branches of science during the half-century covered in Vucinich's study. In short, Vucinich aimed at capturing the "real life" messiness of year-to-year scientific interchange without rendering the larger outlines of development invisible; he has succeeded for the most part in maintaining this intrinsically difficult balance.

Vucinich also gives an account of the major episodes of conflict between Darwinists and anti-Darwinists. The ranks of the latter included some scientists at various points and a larger number of theologians, philosophers, and ideologues such as Danilevskii, whose massive compilation of anti-Darwinian arguments (*Darwinism*, 1885–87) was one of the more relentless and widely cited protests against evolutionary thought issued during that particularly reactionary decade. (During the same decade one could still hear Slavophile objections voiced to the entire idea of empirical sciences as an alien, Western influence that could only corrupt the Russian spirit.) Despite such attacks, Vucinich argues that by the 1880s in Russia the scientific consensus in favor of Dawinism was no longer seriously vulnerable, and its critics were incapable of forming a united front against it. Indeed,