

limited-liability joint-stock company of the sort previously used in canal development and to become crucial in the establishment of the railways. Tomory recounts the halting development of the GLCC. Winsor's grand scheming, which often promised more than could be delivered both to customers and to investors, became a liability, and more sober heads, but above all a structure of corporate management, took over the difficult job of implementing the technology on a large and expanding scale.

Considering the role of users as agents of change places gaslighting in the larger framework of earlier lighting regimes. Tomory shows how users' habits in the use of candles and oil lamps, when transferred to the use of gas lamps, continually frustrated the company's attempts to restrict the timing and extent of gas usage (a move necessary in order to keep demand within deliverable limits). This is a nice example of the networked and tightly coupled character of the technological system. It shows how events in one aspect, in this case users' habitual lighting practices, had ramifications throughout, and through adaptation shaped the eventual nature of, the technological system.

Additional complexity derived from the founding legislation, under which the GLCC could not itself supply gaslighting equipment to the final user. Independent gas fitters, who sought to maximize their own advantage, often at the expense of the quality and efficiency of the lamps supplied, had to be engaged by the company. The GLCC eventually disciplined this recalcitrant component of the system by ensuring the supply of standardized equipment and by instituting workable regimes of inspection and control over the fitters.

Overall, Tomory's excellent book enables historians to see behind the misleading accounts of heroic inventors of gaslighting to a technology with roots in pneumatic chemistry and in the prior traditions of wood and coal distillation. Tomory brings to life the complexities of designing and implementing the initial stages of one of the pioneering networked technologies of the modern era, one that in many ways anticipated important features of the later nineteenth-century 'glamour' technologies of rail, electrification and telephony.

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KARIN REICH and ELENA ROUSSANOVA (eds.), *Carl Friedrich Gauss und Russland: Sein Briefwechsel mit in Russland wirkenden Wissenschaftlern*. Berlin and Boston: De Gruyter, 2012. Pp. xxiii + 905. ISBN 978-3-11-025306-1. €149.95 (hardback). doi:10.1017/S0007087412000908

Carl Friedrich Gauss (1777–1855) was famous in his lifetime as a great mathematician and scientist at the University of Göttingen who hardly ever travelled anywhere but maintained a massive (inter)national scientific correspondence. There are over a dozen volumes of the exchanges with his principal correspondents; this one extends the range somewhat in reproducing his letters with scientists who spent at least part of their careers in a university in Russia. About eighty letters were written by seventeen correspondents and around forty by him; they date right across his career.

Quite often the subject matter was mathematics, but two other topics were prominent. One was astronomy, for Gauss's post at the university was as director of the astronomical observatory, not as professor of mathematics. The other, from the 1830s onwards, was the project that he directed with the physicist Wilhelm Weber to produce a geomagnetic map of the Earth (for which Alexander von Humboldt was the initial inspiring figure). The letters themselves seem usually to be typical in content for their respective concerns; exceptional is the manner of their editing, in the second part of the book. Each correspondent has his own chapter, which starts with a likeness and a timeline, continues with career information and details of the contacts with Gauss, and ends with a transcription of the letter(s). One may feel at times a surfeit of information: for example, the

best-known mathematician correspondent is Nikolai Lobachevskii at Kazan', one of the founders of non-Euclidean geometry, an insight that Gauss had worked out for himself; the sole letter is an expression of thanks for election in 1843 as corresponding member of the Göttingen Academy of Sciences, which is transcribed after forty pages of editorial preparation and has been published before.

Nevertheless, there is much valuable information in these chapters, and the first part of the book is of more general interest, since across 140 pages it provides a wealth of information about both Gauss's interests and Russian academic life. It covers the universities of his correspondents and the Saint Petersburg Academy, the development of a geomagnetic map for Russia, and the surprisingly large number of published translations of Gauss's books and papers into Russian, which was started in the 1830s by students and continued especially in the Soviet period. Even the circumstances of Gauss's learning and reading Russian are covered. The absence of a subject index is regretted, but the book is lavishly provided with a huge bibliography of primary and historical sources, capsule biographies of the large number of figures named in the book, and illustrations of various kinds, including of Gauss's enviable calligraphy. The edition is a valuable contribution to the history of Russian science in the mid- and late nineteenth century, far beyond the matters discussed in the correspondences.

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HARRIET RITVO, *Noble Cows and Hybrid Zebras: Essays on Animals and History*. Charlottesville and London: University of Virginia Press, 2010. Pp. x+239. ISBN 978-0-8139-3060-2. \$39.50 (hardback).

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Harriet Ritvo is very well known to scholars in animal studies and the history of biology. Her groundbreaking work has inspired innumerable books on animals in history, including her own Johns Hopkins series *Animals, History, Culture and the Reaktion* sequence which, at one volume per animal, now stretches to over fifty books. Ritvo's books *The Animal Estate* (1987) and *The Platypus and the Mermaid* (1997) were both classic studies of the cultural contingencies of animal taxonomy in particular, and of human–animal relations generally. More recently, *The Dawn of Green* (2009) has struck out into environmental history, relocating the relationships discussed in these earlier volumes beyond the confines of human culture, and placing them within the landscape itself. *Noble Cows and Hybrid Zebras* fills in some of Ritvo's output in the decade-long gaps between these monographs (mostly the first two), being a collection of essays previously published in sundry journals and edited volumes.

Lord Morton's mare casts her stripy shadow over a good deal of the book. Her first foal, sired by a quagga (a now-extinct relative of the zebra), turned out somewhat stripy – so far so unsurprising – but so did her two subsequent offspring, born to a black Arabian stallion. This Victorian factoid (the results were first reported in 1821) was supposedly proof of telegony, the ongoing influence of a female's first mate. Lord Morton's tale loomed large over warnings to breeders of all sorts for the next century. They needed to guard the virginity of their animal charges every bit as carefully as that of their women; a stray mongrel could wreck the pedigree of a good bitch's descendants. Eighty years later, similar experiments were reprised by James Cossar Ewart and displayed at the Royal Agricultural Society of England; opinions were divided on the use and utility of his investigations, although the takings of his show (an additional sixpence on general admittance) were healthy.

This example highlights several key themes of Ritvo's collected scholarship: pedigree (both human and animal), provenance, gender, farming, commerce and display. The Victorians were both sceptical of this stand-alone anecdote, and unable to jettison it completely, so well did it fulfil