names, organizations, or events. Indexing of abstract concepts, themes, or ideas—even those, like innovation and nationalism, that loom large in the story—is nonexistent. There is also, ironically, no index entry for "steam power" in any form.

The maritime historian Frank O. Braynard's *S. S.* Savannah*: The Elegant Steamship* (1963) has, for nearly half a century, been the standard work on the world's first oceangoing steamship. It is likely to remain the choice of nonspecialists looking for a solid history of the ship and the first stop for specialists wishing to orient themselves before they dive into *Steam Coffin*'s sea of carefully gathered but poorly presented facts.

A. Bowdoin Van Riper

Jimena Canales. *A Tenth of a Second: A History.* xii + 269 pp., illus., bibl., index. Chicago/London: University of Chicago Press, 2009. $35 (cloth).

In this significant contribution to the cultural history of time, Jimena Canales follows the career of the tenth of a second in astronomy, physiology, psychology, art and technology, physics, and philosophy from the mid-nineteenth century to the early twentieth century. Her book is a wide-ranging and thoroughly researched study, based on an impressive range of published and archival sources. Its focus is on France, but it does not neglect the German, American, and British perspectives.

The pervasiveness of the tenth of a second in nineteenth-century science and culture was closely tied to the discovery of certain limitations of human physiology. One tenth of a second is (approximately) the duration of the persistence of our visual sensations and our reaction time to stimuli. It first showed up in the so-called personal equation: the systematic differences, of the order of a few tenths of a second, in the timing of the same phenomenon by different observers. Chapter 2, extending the pathbreaking work of Simon Schaffer and others, revisits the "standard account" of the history of the personal equation, which traced its origins in late eighteenth- and early nineteenth-century astronomy and assigned it to the prehistory of psychology. Canales widens the scope of analysis and discusses how the personal equation "spread beyond astronomy and experimental psychology" (p. 53) and was taken up by mathematicians, physicists, chemists, physiologists, and philosophers, among others.

Chapter 3 examines various attempts in experimental psychology to determine the speed of thought on the basis of reaction-time experiments. In the second half of the nineteenth century, those experiments indicated that the speed of thought was, approximately, a tenth of a second. Thus, this minute time interval came to be understood as "a constitutive unit of human consciousness" (p. 59).

Chapter 4 discusses the role of the tenth of a second in astronomy, focusing on the observations of the 1874 transit of Venus and related astronomical phenomena, such as the solar parallax. The tenth of a second created difficulties in "timing the precise moment of the apparent contact between Venus and the sun" (p. 89). Technical improvements in photography gave rise to the false hope that observation would be fully mechanized and that such difficulties would be thereby resolved.

The disillusionment with photography as a means to tame the tenth of a second is treated in Chapter 5. Echoing some of the themes explored in Lorraine Daston and Peter Galison's *Objectivity* (Zone, 2007), Canales discusses the competition between photography and drawing, especially in astronomy, and the gradual recognition that photography was inferior to drawing as regards the capture of movement. This chapter includes a discussion of cinematography, which was developed toward the end of the nineteenth century with the aim of depicting movement.

Chapter 6 focuses on physicists' attempts in the second half of the nineteenth century to come to terms with the tenth of a second in precision experiments on the speed of light. That research program culminated in interferometry and Albert Michelson's work on the effect of the motion of the earth through the ether. In tune with recent scholarship on the history of relativity, Canales avoids anachronistic readings of interferometry and places it within a context of precision measurement that was not driven by high-level theory.

Chapter 7 revisits the debate between Albert Einstein and Henri Bergson over simultaneity and time. The debate was emblematic of a contest between physics and philosophy about the "ownership" of time, which ended with a victory for physics. This chapter enriches our understanding of the French reception of relativity theory by placing it within a wider philosophical and institutional context.

In the conclusion Canales examines how the tenth of a second caught up with twentieth-century philosophy of science. Karl Popper and Michael Polanyi brought it to bear on their philosophical interpretations of science. Popper used it to support the "dogmatic character" of

observation statements and Polanyi to argue for the personal character of scientific knowledge. Even Thomas Kuhn's antipositivist account of measurement was indebted to the tenth of a second.

In all, I have two critical comments. First, the experimental practices associated with the tenth of a second are not discussed in the detail I would have liked. For example, in the discussion of Wilhelm Wundt's reaction-time experiments several instruments for measuring the "speed of nerve transmission" are mentioned, without any analysis of how those instruments worked. Second, a closer look at the literature on the history of philosophy of science would have strengthened the concluding philosophical chapter. Recent work on the origins of Popper's philosophy of science, for instance, has established the debt of his philosophy of science to psychology and, thus, would make possible a contextualization of his ruminations on the personal equation.

Nit-pickings aside, this is a splendid book. It narrates a significant chapter in the history of observation with elegance and verve and will appeal to historians of science with an interest in the history of epistemic categories and, more generally, to students of the history of time and modernity. *A Tenth of a Second* deserves a wide readership.

THEODORE ARABATZIS

François Delaporte; Emmanuel Fournier; Bernard Devauchelle (Editors). *La fabrique du visage: De la physionomie antique à la première greffe, avec un inédit de Duchenne de Boulogne.* (De Diversis Artibus, 85 [N.S., 48].) Turnhout, Belgium: Brepols Publishers, 2010. €65 (cloth).

The theme of this volume focuses on two events. The first is historical: the experimental studies of the relations between the movements of facial muscles stimulated by electrical currents and the expression of sensations carried out by the French physiologist Guillaume Benjamin Amand Duchenne de Boulogne (1806–1875) from the 1850s to the 1870s. The second is recent: the first successful surgical partial transplantation of an extremely mutilated human face, done in 2005 by the surgeon Bernard Devauchelle (one of the editors here) together with colleagues at the University of Picardie Jules Verne at Amiens (France).

Although the achievements in the fields of myology and neurology of Duchenne de Boulogne, who furthered electrical diagnostics and therapeutics, are well known in the history of medicine (see Jean-Charles Sournia's *Histoire de la médecine* [La Découverte, 1978], published in a German version by Richard Toellner: *Illustrierte Geschichte der Medizin*, Vol. 3 [Andreas & Andreas, 1980], pp. 1162–1164), this edition of his unpublished essay, accompanied by a collection of pictures, will be welcome to historians of biology, medicine, and electrophysiology. It is a manuscript from 1857 (ca. 30 pages), entitled "Considérations sur la mécanique de la physionomie," that was found in the Archives Nationales of France in 1998. The essay presents Duchenne's first studies, based on electrophysiological experiments, of expressive movements of human faces, documented by photographs. In contrast to his later publications (1862, 1867, 1876), in this manuscript Duchenne explains the aim and methods of his research in detail. In terms of both, he turned away from traditional physiognomy and achieved an epistemological transformation by searching for "the rules of the language of passions" ("les règles du langage des passions"), as François Delaporte states in the introduction (p. 8; cf. this edition of Duchenne's manuscript, p. 2). Duchenne was able to use the new knowledge of the anatomy of the head and the methods of electrophysiology of his time. Historians will note that Duchenne's studies may be interpreted as one starting point—based on the contemporary mechanistic thinking—of research in the field of behavioral physiology, more than a decade before Darwin published his observations in *The Expression of the Emotions in Man and Animals* (1872). In addition, however, Duchenne's work was also a contribution to traditional physiognomy, the history of which is briefly recounted by Simon Byl (pp. 123–133), in that he accepted its basic idea and pointed out that the face expresses the passions and sensations of a human being.

This point must be taken into consideration by the modern facial surgeon as well. The documentation of the first case of a successful partial transplantation of a human face is followed by discussions on approaches for decoding some bodily marks in hard-working people in the eighteenth century (Arlette Farge), head and facial structures during the nineteenth century (François Dagognet), movements of the facial muscles, with a focus on Duchenne's analyses (Emmanuel Fournier), and the first facial expressions of a newborn child (Pierre Rousseau). The very detailed protocol documenting the most important preparations for the partial facial transplant, the performance of the operation by a team of medical specialists on 27 November 2005, and the follow-up care of the female patient (Sylvie Testelin) is introduced by an essay by the director of the operating team, Bernard