books

An experimental reconstruction deconstructed

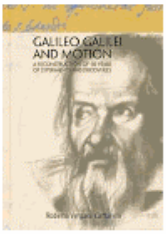
Galileo Galilei and Motion

A Reconstruction of 50 Years of Experiments and Discoveries

Roberto Vergara Caffarelli
Società Italiana di Fisica, Bologna, Italy, and Springer, New York, 2009. $129.00 (296 pp.). ISBN 978-3-642-04352-9

Reviewed by Paolo Palmieri

Galileo Galilei started out as a professor of mathematics at the University of Pisa, Italy, in 1589, when natural philosophy was a loose bundle of Aristotelian doctrines. Professors of natural philosophy then considered it their job to discuss and defend the works of the Greek philosopher whose teachings, embedded in a broad framework of Christian ideas, had become prominent in European universities during the late-medieval and Renaissance eras. What made Aristotle's writings important is complex, but one primary element was that his nonmathematical doctrines could be accommodated by natural philosophy's qualitative approach.



In *Galileo Galilei and Motion: A Reconstruction of 50 Years of Experiments and Discoveries*, Italian physicist Roberto Vergara Caffarelli confirms recent findings by other scholars that Galileo broke away from the qualitative Aristotelian doctrines by following a quantitative Archimedean thread. The book is remarkable: In it, Caffarelli, proceeding chronologically, plausibly re-creates and expounds on the sequence of experimental studies that led Galileo to discover the law of falling bodies.

After studying in great depth Archimedes' theory of floating bodies, Galileo invented equipment for novel experiments on such bodies; after that, he built many successful experimental devices, including the famous inclined plane. The book contains interesting pictures of Caffarelli's reconstructed floating-body apparatuses and duplications of Galileo's inclined planes, which, in Caffarelli's view, eventually led Galileo to formulate his epoch-making theories of motion.

Caffarelli often effectively employs a clever rhetorical device—he uses questions as subtitles for important sections as in, for example, "What did Galileo see while he studied motion in water?" (page 51). However, that section, which describes what Caffarelli saw in his reconstruction and how he interpreted his observations, will lead readers to ask themselves: To what extent can we equate what we see in the modern reconstruction of a four-century-old experiment with what Galileo saw? The question is bound to arise at every turn of the book's pages, but the author never addresses it. That, however, is not necessarily a weakness of the book, since we may appreciate a book not only for the answers it provides, but also for the questions it leaves unanswered. Good scholarship is thought provoking and often not thought assuaging.

A seemingly mundane aspect of Caffarelli's writing style is worth noting: He neatly presents his results using modern formulas. That presentation raises the question, To what extent does the format of experimental data influence the way we interpret the results? In short, what we see when we re-create an experiment, in particular if we present the data with modern formulas, may not be the same as what Galileo would have seen. Once again, Caffarelli leaves the reader to ponder. And so will I.

I will, however, conclude with a reflection on what I took away from *Galileo Galilei and Motion*. After reading it, I found myself more and more perplexed about the kind of knowledge we acquire while doing history of science. It became clearer to me that the history of science is not just about the past: *Galileo Galilei and Motion* is not just a book about Galileo's discovery process, but also a book about Caffarelli himself. That thought led me to ask even more perplexing questions: Is a scientific experiment really objective? Is it really possible to replicate an old experiment? And what do we mean by replication? Caffarelli has brilliantly succeeded in disturbing my way of thinking.

Paolo Palmieri is a professor in the department of history and philosophy of science at the University of Pittsburgh and director of the department's history of science laboratory facility. He co-authored the book, *Reenacting Galileo's Experiments: Rediscovering the Techniques of Seventeenth-Century Science* (Edwin Mellen Press, 2008).

Predicting the Unpredictable

The Tumultuous Science of Earthquake Prediction

Susan Hough
Princeton U. Press, Princeton, NJ, 2010. $24.95 (260 pp.). ISBN 978-0-691-13816-9

Scientists who work in the fields of earthquake prediction and climate-change studies have something in common: They often find themselves in adversarial situations with amateurs. Why do people who barely know what an earthquake is think they can predict them? Says Charles Richter, "What ails them is exaggerated ego plus imperfect or ineffective education, so that they have not absorbed one of the fundamental rules of science—self-criticism."

That quote is found in Susan Hough's timely book, *Predicting the Unpredictable: The Tumultuous Science of Earthquake Prediction*, a comprehensive, broadly accessible, and readable overview of the ups and (mostly) downs of earthquake prediction over the past 50 years. A seismologist at the US Geological Survey, Hough has the rare gift of being able to write about highly technical subjects in an easy

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