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Book Review

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The Dawn of Fluid Dynamics: A Discipline Between Science and Technology

Eckert, M., Wiley-VCH, Weinheim, Germany, 2006, 296 pp., $80.00

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FLUID dynamics is a wide-ranging subject with an opulent history that dates back to antiquity. As a branch of physics, fluid mechanics is a significant hard science that has its fair share of fascination, mathematical elegance, complexity, and at least one of the grandest unsolved problems of our time. But fluid mechanics is also a discipline that is technologically important in numerous applications. In fact, fluids are so pervasive in nature and in man-made devices that it is hard to avoid them. We study fluid mechanics to gain fundamental understanding of our universe and to be able to predict both mild and severe weather phenomena. We need the discipline to better design our transportation, manufacturing, energy conversion, and HVAC systems. Last but not least, significant fluid transport processes take place in all biological systems, down to the cellular level. To write a book about the dawn of fluid dynamics and how the broad discipline is an important link between science and technology is, therefore, a daunting task that perhaps no one author can tackle. Michael Eckert, a theoretical physicist turned historian of physics and working for the Deutsches Museum in M nchen, Germany, certainly did not accomplish that daunting task in the present book, but instead covered a very narrow aspect of what the book's title proclaimed. In that sense, the present title is a bit ostentatious, if not outright misleading. The book essentially covers the history of fluid dynamics in the first half of the twentieth century, and only as viewed by Ludwig Prandtl's impact on the discipline, focusing in particular on the science–technology dualism. The author, nevertheless, emphatically proclaims that his book is not a biography of Prandtl.

Ludwig Prandtl is without a doubt one of the greatest mechanists of the twentieth century. But to give him the sole credit for all advances taking place during the period 1900–1950, as the present author unabashedly and relentlessly proclaims, is not fair to the many other greats who lived during the same period: William Prager, Geoffrey I. Taylor, Andrey Nikolaevich Kolmogorov, and Theodore von K rm n, to name a few. Was Prandtl first among equals? Perhaps, but Eckert does not provide a convincing argument for that other than writing such things as Taylor calling Prandtl "our chief who deserved a Nobel prize." In a 1969 *Annual Review of Fluid Mechanics* article, as well as in the 1938 book *Modern Developments in Fluid Dynamics*, Sydney Goldstein possibly provided a stronger case for anointing Prandtl the head of the pack.

The present book is organized around the most important of Prandtl's contributions: the boundary layer theory, mixing-length theories of turbulence, and airfoil theory. Of course, the superb experiments that Prandtl and his students conducted to go hand-in-hand with all of those influential theories are also discussed in detail. In the first chapter, the book very briefly recalls few of the developments in mechanics that took place before the Prandtl's golden era: Galileo's abstraction; Newton's *Principia Mathematica*, the hogs' bladder experiments; D'Alembert's paradox; Reynolds' direct sinuous flow; and the state of the two disparate disciplines of hydraulics and hydrodynamics at the dawn of the twentieth century. The early G ttingen years 1904–1914, when the boundary layer and airfoil theories originated, are then chronicled. Aviation and the rise of aerodynamics in the First World War era are then discussed. The following four chapters cover the internationalization (nowadays, globalization) of fluid mechanics in the 1920s: research in turbulence, aerodynamics and applications in gas dynamics, cavitation, and geophysical flows. Three more chapters tally Prandtl and National Socialism; important new centers of fluid mechanics research (Aachen, Pasadena, and Z rich); and fluid dynamics on the eve of World War II. Finally, the crux of the matter, the author's own philosophy on fluid mechanics as a discipline between science and technology, is delivered in a nicely written 10-page epilogue.

The book is logically organized, well-researched, and well-written. For any reader interested in Prandtl and his many contributions to science and engineering, the book provides useful, accurate information supported by numerous references and notes. The English is flawless with very few errant phrases, likely resulting from literal translation from the German. The writing is factual, albeit a bit austere. A reader who is searching for lively history will not find it in the present 296-page book. In the unadorned words of Sergeant Joe Friday of *Dragnet* fame: "Just the facts, ma'am." The Appendix contains a list of abbreviations, 683 references, and author, name,

and subject indices. This extensive list of references and notes alone is worth the price.

Despite the few preceding quibbles regarding the pretentious title, narrow focus, and Prandtl's ranking, I value the information the book provides in minute detail. For all lovers and aficionados of fluid mechanics, professionals, and amateurs, *The Dawn of Fluid Dynamics: A Discipline Between Science and Technology* is a recommended read.

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