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REVIEW

A History and Philosophy of Fluidmechanics. By G. A. Tokaty. G. T. Foulis and Co. Ltd, 1971. 241 pp. £4.50 (hardback) or £2.25 (paperback).

This book, which stems from occasional lectures given by the author, attempts to provide a comprehensive review of fluid mechanics (or 'fluidmechanics') and purports to be both history and philosophy. Unfortunately, clichés and colloquialisms that may have made the lectures lively enough, for example "I should like to call Leonhard Euler to the witness box." (p. 97) and "But since Russia is far too big a cake..." (p. 120), make it difficult to take the author seriously as either an historian or a philosopher.

More serious than the deficiencies of style are the distortions and inaccuracies. Consider, for example, the following passages (pp. 103, 104).

> "Yes, they all – Aristotle, de Vinci, Newton, Euler, d'Alembert and the rest – proved to be too small to understand the great 'thing' called 'force'. While he, Lazare Carnot, 'always knew' that nothing could be clearer than force. ...and whenever and wherever there is momentum, there is also force...the two being associated by the formula
>
> $$\vec{F}dt = d(\vec{mv}).$$
>
> Apart from the arrows, this is in fact, Newton's formula.
>
> But it was not merely given by Carnot: he derived and proved it. This is not surprising at all for Carnot was one of the few people of his time to whom a theory divorced from practice was like a Queen deprived of her kingdom. ...His *Réflexions sur la Puissance motrice de feu* introduced us to thermodynamics...It is, therefore, both inaccurate and unfair historically to depict him...as one whose ideas 'had no great influence on the progress of science' [Jeans, *The Growth of Physical Science*, Cambridge, 1947, p. 268].
>
> The Carnot Cycle in itself was, and remains, an outstanding mile-stone... Then, was he not one of the builders of modern geometry?...And what about his impulse–momentum equation...?"

On first reading these passages, I had no recollection of Lazare Carnot and assumed that Tokaty had carelessly replaced Sadi by Lazare (there are several such slips, e.g. 'Hadamart' for Hadamard), but then Professor Truesdell pointed out to me that Tokaty had confused father, Lazare, and son, Sadi. (Lazare Nicholas Marguerite Carnot played a major role in the French Revolution and is given approximately two columns in the eleventh edition of the *Encyclopaedia Brittannica*, as compared with one column for Sadi Nicholas Léonhard Carnot. On turning to the passage quoted from Jeans, I found, that *after* stating that Carnot's *Réflexions* "not only founded the modern science of thermodynamics, but also gave it its present form", Jeans goes on to say that "Carnot's ideas had no great influence on the progress of science *until* [my italics] they were recaptured by...Joule...." This latter statement is perhaps in-

accurate and unfair (to Clapeyron, Clausius, and Kelvin, as well as to Carnot), but it conveys a quite different sense than Tokaty's truncated quotation. So, in a relatively short space, we find a frivolous denigration of some of the greatest figures in the history of mechanics, a ridiculous attribution of the impulse–momentum principle, an inexcusable confusion of the work of two eminent men, and quotation significantly out of context.

The emphasis placed on different ideas and different men is, to say the least, capricious. Kelvin is given eight lines, under the heading "Helmholtz (1821–94) and others", and is cited only once in the index. Prandtl is cited sixteen times in the index but is given no definite biographical entry; his contributions to wing theory are allotted a paragraph under "Lanchester (1878–1946) and others", whilst his contribution of boundary-layer theory is allotted three paragraphs under "Froude (1810–79) and others". In contrast, fourteen pages and four plates are devoted to Flettner and his relatively ephemeral contributions to technology. I am aware that the contemporary fame of Flettner's rotorship was such that even Einstein dealt with it in a popular essay (subsequently included in *Mein Weltbild*, Querido Verlag, Amsterdam, 1933), but fourteen pages to a series of essentially unsuccessfully inventions versus three paragraphs to the boundary-layer theory can scarcely be regarded as an historically balanced perspective.

I do not wish to leave the impression that Tokaty's writing is utterly without any redeeming social value. He does, for example, suggest the possibility of compromise in the continuing (at least in the United States) battle over metrication by defining (p. 3) "a large calorie (as) the amount of heat required to raise the temperature of 2·2 pounds of water by one degree centigrade". On the whole, however, the value of this book for fluid mechanics is essentially negative.

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