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Book reviews

C.-C. Wang, **Mathematical principles of mechanics and electromagnetism, Part A: Analytical and continuum mechanics**, Volume 16 in the Series: Mathematical Concepts and Methods in Science and Engineering, Plenum Press, New York and London, 1979, xix + 198 pp., price $ 29,50 ($ 35,40 outside U.S.)

As far as I know textbooks on classical mechanics contain two passages which are difficult to follow. The first one occurs where the linear and angular momentum balance laws for rigid bodies are derived from the equations of motion of a mass point only. To this end a vague and inadequate model of a rigid body is introduced in regarding it as a limiting case of a rigid system of mass points. The second time the reader is embarrassed when the equations of Lagrange are derived for a system of mass points, free or with any constraints, and subsequently are applied to rigid bodies, mostly without comment. If any justification is given one refers loosely to the above model. The author of the present book does not follow this traditional approach. In chapter 1 he accepts rigid bodies as primitive concepts like mass points, with independent equations of motion. As a consequence Lagrange's equations for systems of mass points and for rigid bodies are derived from the equations of motion for mass points and for rigid bodies separately. In this way the author does not use any argument based on the questionable limiting process. Chapter 2 gives a thorough treatment of Hamiltonian systems in phase space in terms of modern mathematical notions from differential geometry. The chapters 3 and 4 are devoted to continuum mechanics. In chapter 3 the author gives a masterly survey of the basic principles of continuum mechanics. As an illustration of these principles he treats in chapter 4 three topics: the theory of viscometric flows of simple fluids, the universal solutions of isotropic elastic solids, and the mathematical formulation of continuous distributions of dislocations in elastic bodies. From the preface it is clear that the book has been written as an introductory text for advanced undergraduate students. They will find most of the mathematical preliminaries in the two-volume work Introduction to Vectors and Tensors, written by R. M. Bowen and the author, and published in the series to which the present book belongs. In my opinion the author has succeeded in showing these students how the two main subjects, the analytical and the continuum mechanics, are to be embedded in linear algebra and analysis. The addition of a number of excercises would have contributed to the value of the book.

M. Kuipers

C.-C. Wang, **Mathematical principles of mechanics and electromagnetism, Part B: Electromagnetism and gravitation**, Volume 17 in the Series: Mathematical Concepts and Methods in Science and Engineering, Plenum Press, New York and London, 1979, xviii + 188 pp, price $ 29,50 ($ 35,40 outside U.S.)
[The price of the two-volume set is $ 55,00 ($ 66,00 outside U.S.)].

This part has been written in the same style as part A: to achieve a precise and succinct exposition of basic principles the author uses contemporary mathematical concepts, mainly from differential geometry. There are no strong connections between the two parts; only a few topics in part A, such as the balance principles and the field equations in continuum mechanics, and the principle of frame-indifference are referred to in part B. The book contains four chapters. Chapter 5 on the classical theory of electromagnetism includes a section called: Electromechanical interactions, in which Toupin's theory of a non-magnetic elastic dielectric medium is presented. The chapters 6 and 7 treat the special relativistic theory of electromagnetism and the general relativistic theory of gravitation, respectively. Again, recent results obtained by Toupin are given in chapter 7, and also in chapter 8 on the general relativistic theory of electromagnetism. I recommend this book because of the clarity of author's style and the rigour he pursues in his analysis.

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