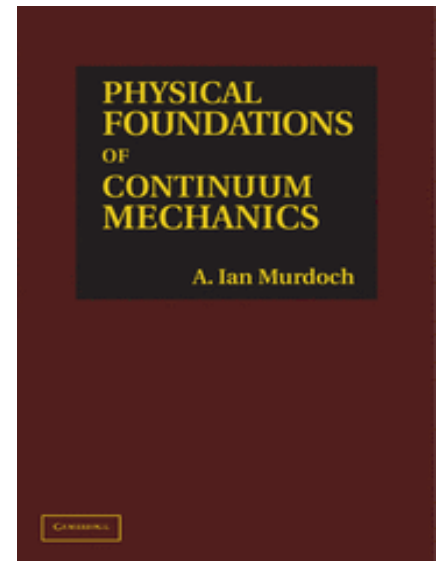


Physical Foundations of Continuum Mechanics

A. Ian Murdoch
University of Strathclyde

Ian Murdoch's *Physical Foundations of Continuum Mechanics* will interest engineers, mathematicians, and physicists who study the macroscopic behaviour of solids and fluids or engage in molecular dynamical simulations. In contrast to standard works on the subject, Murdoch's book examines physical assumptions implicit in continuum modelling from a molecular perspective. In so doing, physical interpretations of concepts and fields are clarified by emphasising both their microscopic origin and sensitivity to scales of length and time. Murdoch expertly applies this approach to theories of mixtures, generalised continua, fluid flow through porous media, and systems whose molecular content changes with time. Elements of statistical mechanics are included, for comparison, and two extensive appendices address relevant mathematical concepts and results. This unique and thorough work is an authoritative reference for both students and experts in the field.



Contents

1. Introduction; 2. Some elements of continuum mechanics; 3. Motivation for seeking a molecular scale-dependent perspective on continuum modelling; 4. Spatial localisation, mass conservation, and boundaries; 5. Motions, material points and linear momentum balance; 6. Balance of energy; 7. Fine-scale considerations: moments, couple stress, inhomogeneity and energetics; 8. Time averaging and systems with changing material content; 9. Elements of mixture theory; 10. Fluid flow through porous media; 11. Linkage of microscopic and macroscopic descriptions of material behaviour via cellular averaging; 12. Modelling the behaviour of specific materials: constitutive relations and objectivity; 13. Comments on two non-local balance relations; 14. Elements of classical statistical mechanics; 15. Summary and suggestions for further study; Appendices.

November	2012	253 x 177 mm	480pp	24 b/w illus.
Hardback		c. £75.00		978-0-521-76558-9

For more information on these titles, please visit our website:
www.cambridge.org/9780521765589

Cambridge University Press, The Edinburgh Building, Cambridge CB2 8RU, UK



CAMBRIDGE
UNIVERSITY PRESS
www.cambridge.org