

Magnetic fields influence many natural and man-made flows. They are routinely used in industry to heat, pump, stir and levitate liquid metals. There is the terrestrial magnetic field which is maintained by fluid motion in the earth's core, the solar magnetic field which generates sunspots and solar flares, and the galactic field which influences the formation of stars. This is an introductory text on magnetohydrodynamics (MHD) – the study of the interaction of magnetic fields and conducting fluids.

This book is intended to serve as an introductory text for advanced undergraduate and postgraduate students in physics, applied mathematics and engineering. The material in the text is heavily weighted towards incompressible flows and to terrestrial (as distinct from astrophysical) applications. The final sections of the text also contain an outline of the latest advances in the metallurgical applications of MHD and so are relevant to professional researchers in applied mathematics, engineering and metallurgy.

Dr. P.A. Davidson is a Reader in Fluid Mechanics at the University of Cambridge, where his current research is in fluid mechanics in process metallurgy, turbulence and stability theory. He is the author of over 50 publications, and was awarded the Institute of Materials prize in 1996 for the best paper on non-ferrous metallurgy.

An Introduction to Magnetohydrodynamics

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