Parker and others, had therefore to be carried out without the support and comfort of an 'existence theorem' demonstrating that flow and field configurations of a 'non-Larmor' type in a simply connected electrically conducting body of fluid could produce dynamo action. Fortunately for the development of the subject, Backus and Herzenberg were able in 1958 to provide two independent proofs of such a theorem, and research towards the elucidation of the details of the dynamo mechanism has grown rapidly since that time.

The method of attack is almost entirely mathematical, because of the practical difficulty of attaining sufficiently high values of the so-called 'magnetic Reynolds number' $R$ with available laboratory fluids. ($R$ is defined as the product of four quantities: the electrical conductivity, magnetic permeability, typical speed of fluid flow and typical length scale of the system; it is thus quite high even for poor conductors on the length scale of astronomical systems, and this is why the study of 'magnetohydrodynamics' first emerged from astrophysical investigations.) Several excellent reviews of dynamo theory have appeared in the specialist literature during the past few years, but Professor Moffatt has provided the first monograph setting out "the general mathematical theory of magnetic field generation by inductive fluid motion, with particular reference to the two most accessible examples of cosmic bodies (Sun and Earth) exhibiting magnetic fields", with the objective of placing a wide range of work within a common framework and clarifying areas of overlap as well as areas of conflict in this technically highly complex subject.

A dominant idea which recurs throughout this book, which is based on a graduate lecture course given over a number of years at Cambridge, is the lack of reflexional symmetry of fluid flows capable of producing dynamo action; in short, typical fluid eddies in 'non-Larmor'-type configurations have a helical structure. A measure of this lack of reflexional symmetry is the pseudo-scalar quantity 'helicity', defined as the scalar product of the flow velocity vector and the local 'spin' vector (vorticity) of the fluid. In the author's words, "In a sense, this is a book about helicity; the invariance and topological interpretation of (helicity) are discusssed at an early stage (chapter 2) and the central importance of helicity in the dynamo context is emphasised in chapters 7 and 8. Helicity is also the main theme of chapter 10 (on helical wave motions) and of chapter 11, in which its influence on turbulent flows with and without magnetic fields is discusssed".

As far as the rest of the book is concerned, chapter 3 deals with the convection, distribution and diffusion of magnetic fields, and chapters 4 and 5 are accounts of the magnetic fields of the Earth and Sun, with a few remarks about the fields of other planets. Chapters 6 and 9 deal respectively with laminar and turbulent "kinematic dynamos", in which the field of fluid flow is specified *a priori* in the calculation of magnetic effects from the equations of electrodynamics. It is with this part of the subject that the most striking progress has been made during the past decade by workers in several countries, including the Soviet Union and the German Democratic Republic. The final chapter indicates what little work has been done on the much more difficult problems arising from the investigation of 'magnetohydrodynamic dynamos' which seeks simultaneous solutions of the equations of hydrodynamics and electrodynamics.

This book is certainly not aimed at the mathematically faint-hearted but, in the tradition of the Cambridge University Press monographs on Mathematics and Applied Mathematics edited by Professors G. K. Batchelor and J. W. Miles, the subject is introduced in an interesting way, and the mathematical equations and derivations are well supported by physical ideas and explanations. The book contains a few misprints and errors (for example Herzenberg's famous paper is inadvertently omitted from the list of references) and can be recommended to anyone interested in the nature of cosmical magnetic fields, which Einstein evidently regarded as presenting one of the most important unsolved problems in physics.

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# Progress report on perception

*The Perceptual World.* By Kai von Fieandt and I. K. Moustgaard. Pp. 680. (Academic: New York, London and San Francisco, 1978.) $62.50; £32.

DRAW a rough sketch of what could be called a map of knowledge. Physics and astronomy would share common frontiers with chemistry and geology which in turn have borders with molecular biology and physiology. There are many disciplines each of which has its own set of concepts and language. For some subjects, however, it is not always clear where the borders are; for example, modern linguistics merges imperceptibly into terrains where philosophy, mathematics and logic have traditionally held sway. Nowhere is this problem more acute than for psychology. Suffice to say its subject matter is vast; its methods and procedures are parasitic upon many other disciplines, but at the same time it is not always clear what it is that constitutes a problem for the psychologist. But psychology does have one concern where a clear picture of its problems are emerging and where there are now concepts and a language appropriate to it. This area of psychology is what is generally referred to as perception. Perceptual psychology has two concerns: first, how events in the external world become stored as information in the brain, and second, how this stored information becomes knowledge of the world. Psychologists have made great strides with the first problem but the second still awaits clarification from philosophers and workers in artificial intelligence.

*The Perceptual World,* written by psychologists, is a progress report of work in perception. This work is backed up by the insights and methods from colleagues in many other disciplines. John Mollon's two chapters indicate the scope of the enterprise. He discusses neural coding and analysis, and in doing so, annexes to the service of perceptual psychology large areas of what was previously thought to belong exclusively to the province of neurophysiology. But he does this to good effect; he shows, for example, that at the neural level an account can be given of how external events are detected, coded and stored in the brain. This ecumenical spirit pervades the book, and so we find that the chapter on psychophysics draws on signal detection theory, which was originally developed by communication engineers to describe information flow in noisy systems.

Many books on perception deal all too exclusively with the input side—with the collection coding and storage of information—to the neglect of the output which issues as behaviour and experience. *The Perceptual World* avoids this fault: there are chapters dealing with object perception and the perception of self and these chapters therefore have something to say about knowledge of the world. This final section of the book discusses the experience of perception, and how this interacts with the perceiver's personality, life history and culture. The chapter on pictorial art is a *tour de force,* and manages to be original and interesting and to avoid the woolly inanities which so often pass for discussion on this topic.

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