The JET project and the prospects for controlled nuclear fusion

Edited by

R.S. Pease, F.R.S., and R.J. Bickerton

Nuclear fusion of the light elements offers an essentially limitless source of energy, which might be developed for practical use if the high-temperature conditions can be achieved and controlled. The Joint European Torus – JET – is a major international experiment, conducted jointly by EURATOM and fifteen research organizations of Western Europe, to achieve thermonuclear reactions in conditions close to those needed for net energy production. It aims to establish the physical principle of confining and of heating hydrogen isotopes in multimegampere electric discharges with additional heating systems.

This volume, the report of a Royal Society Discussion Meeting held in March 1986, presents reviews of the principles of the method and engineering realization of JET; it describes the promising experimental results so far achieved, both in JET and in a similar American experiment; and compares these results with theory. The review relates the progress of JET to the overall EURATOM programme of nuclear fusion research, and its future development.

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In view of the pervasive importance of predictability in the physical, biological and social sciences, the Royal Society and the British Academy decided to hold a joint Discussion Meeting on this subject in March 1986. This led to a vigorous and informative exchange of views between the participants from a wide range of disciplines.

This book contains the invited papers, each of which is written for the non-specialist, and contains much to interest and stimulate workers in related fields.

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DYNAMICAL CHAOS

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A major advance in the mathematical science of recent decades has been the discovery that systems can behave unpredictably even when their evolution is causally determined by known laws. The development of the subject is the result of a synergism between pure mathematics and natural science, aided by computation (especially graphics). An intense international research effort is now directed at understanding in detail the many varieties of chaotic behaviour and the many settings in which they can occur.

This spectrum of ideas stimulated a Royal Society Discussion Meeting in February 1987, and this book contains the papers presented at the meeting. The range of topics is wide. In mathematics, there are accounts of ways in which the characteristics of chaotic systems can be inferred from time series, simple geometrical models exhibiting chaos, and detailed descriptions of chaos based on number theory and renormalization transformations. In biology, there are applications to normal and anomalous heart rhythms and to population dynamics. Several papers deal with turbulence. In physics, there are applications to the mechanics of the Solar System, magnetic confinement of particles, and the quantum theory of molecules.

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