State of the Universe

Stuart Sharrock

The Key to the Universe: A Report on the New Physics. By N. Calder. Pp. 196. (British Broadcasting Corporation: London, 1977.) £5.95. *From Quarks to Quasars: An Outline of Modern Physics.* By S. Thomas. Pp. viii+294. (Athlone: London, 1977.) £3.95.

VERY few books deserve to be read. Some are memorable for the information they contain and others for the pleasure they give. It is a rare delight to find a book that fulfils both these criteria. On the whole Nigel Calder's latest offering, *The Key to the Universe*, is such a treat. At times the complexity of the subject is overwhelming and tedium sets in, but these occasions are few and forgivable. Most of the book manages to convey the sense of excitement and achievement so sadly missing in the majority of texts on physics. It must be admitted, however, that reading this book can be hard work—the very subject matter ensures this—but those who persist will be well rewarded. The great advantage compared with the television programme presented by Nigel Calder on the same topic, is that the concepts can be taken in at a leisurely pace and the reader can refer back to items which were incompletely understood at first sight.

The Key to the Universe is an attempt to explain in layman's terms the recent developments in elementary particle physics and astrophysics which promise to produce a theory of the workings of the universe. Beginning with electricity and rapidly plunging into the weak force and gauge theories, quarks, colour and charm, the story moves on to gravity and exploding black holes, the Big Bang and broken symmetries. These concepts are described in plain language and the text provides an excellent introduction to current beliefs concerning the origin of the Universe, how it works and how it is evolving. Only a Philistine could claim that this topic is not of interest; here it is presented in a manner which is accessible and enjoyable.

Like all good adventure stories there is a hero—the physicist. Not a single individual but a series of people doing experiments and propounding theories. The potentially obscure concepts are illuminated by this emphasis on the personalities behind the ideas. But the story presented is one of almost un-

qualified success, and consequently sounds at times a little contrived; it would be more realistic and gripping if the villains also made an appearance.

My major reservation is the fact that there are insufficient explicit statements about the relative standing of different concepts. Ideas are given more or less equal weight irrespective of their current status. The experimental basis for charm is rather stronger than that for the decay of the proton, for example, and the unification of electromagnetism and the weak force is considerably more advanced than unification schemes involving gravity. The unwary reader may not recognise this.

The initiated—whom are not synonymous with the intelligent—will no doubt find details which irritate. The muon, for instance, may well just be a heavy electron but it has had its own identity for decades; I find the label “heavy electron” bewildering and sad. But this is a minor level of complaint about an attempt to explain the workings of the Universe in 200 pages.

As a chronicle of recent achievements presented in an exciting and responsible fashion this book is unrivalled; the concerned reader will gain access and understanding to an important part of our culture, but not without hard work. This book demands to be read.

From Quarks to Quasars is an entirely different style of book. The suggestive title is misleading as only 10% of the text is concerned with astrophysical phenomena, and the message of the book is not the connection between theories of the microscopic and the macroscopic. No attempt is made to be up-to-the-minute—charm is still a dream of the future and black holes do not explode.

What is presented here is a competent introduction to the atomic nature of matter at an elementary and descriptive level; the basic concepts are introduced and applied to provide a useful summary of the various states of matter: gases, plasmas, liquids and solids. Properties of the nucleus and elementary particles are discussed almost as in a catalogue of ‘useful facts’, and the chapters on quarks and quasars are pure appendages.

This is a physics book containing a large amount of useful, well-ordered and basic facts presented at an elementary level in a readable but unexciting style. It is ideal background reading for budding physicists about to start a university course; the uncommitted will find it useful but uninspiring. □

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