proposed by Bernard Oliver, arising from a careful study which culminated in Project Cyclops, a summer study at Ames in 1971. This project involves the proposal for the construction of a huge array of 100-m radio dishes spread out over about 100 km^2, to search a million stars out about 1,000 light years away. This search might take many years to complete, but in view of the cosmic importance of the project, such a long term allocation of resources is deemed to be justified. Oliver devotes part of his paper to the discussion of concrete proposals for hardware and experimental procedures. The system could also be used for transmitting, but in view of the fact that we must be by far the youngest technical community in the Galaxy, it is assumed that the responsibility for this rests on other (extraterrestrial) shoulders.

Some lively discussion is presented about how two communities who know that they want to contact each other but don't know where to look ought to go about attracting attention. Simple radio beacons are an obvious if rather unsubtle procedure. Dumping a rare metal into the local star to bewilder distant spectroscopists is another suggestion. Bracewell discusses an intriguing conjecture that probes may be sent around the Galaxy to lie in wait near a hopeful system. If radio signals are received it immediately beams them back as a delayed echo, thereby attracting the attention of an assured audience. Novelties of this sort, though purely speculative, are nevertheless of great general interest and this book is to be thoroughly recommended as a good all-round introduction to the subject.

One final point. Most of the contributors reject the possibility of direct spaceflight between galactic communities because of the vast distances and uncertain destinations involved. It is difficult to fault their reasoning. Anybody who is uneasy about signalling other, possibly bellicose, intelligent beings need fear no invasion. In any case, even Marconi's pioneering signals are now a mere few dozen light years out in space and very probably haven't yet reached any interested ears.

P. C. W. Davies

Everyman's Astronomy. Edited by R. H. Stoy. Pp. 493+48 plates. (Dent: London, January 1975.) £4.50.

ANYONE who has followed the development of astronomy over the past few exciting years will realise that this otherwise excellent book is about four years out of date. Black holes are not even mentioned in the index, X-ray sources receive scant attention, and even the discussion of pulsars is most notable for its omissions. Perhaps most seriously of all, given the readership for which the book is clearly intended, the recent probes to Mars (Mariner 9), Venus and Mercury (Mariner 10) and Jupiter (Pioneer 10 and 11) all produced their dramatic new data after *Everyman's Astronomy* was ready for the press.

There is, of course, a reason for this unfortunate gap. The volume, intended to replace the successful *Astronomy for Everyman*, was conceived in 1960 when several chapters were commissioned, but was later abandoned until 1969 when Dr R. H. Stoy was called upon to complete the project. As he says in a preface, "the epoch of the book as a whole is approximately 1970"; but further delay arose because of the need for extensive editing to ensure homogeneity and to reduce any overlap in contributions gathered over the best part of a decade.

With hindsight, there is no doubt that the publishers would have done better to wait for another few years and produce the definitive book of its kind for the late 1970s. The present round of exploration of the Solar System is now complete, and there is likely to be a lull until Mars landers, and the passage of Pioneer 11 past Saturn, revive interest in the late 1970s. In other areas of astronomy, the entire electromagnetic spectrum is now open to view from satellites, including γ rays, X rays and infrared radiation, so that again we are standing at a watershed in the development of the science.

But the failure of the book to have caught just the right tide in the affairs of astronomy only assumes importance because what is covered here is covered so well. With nine first rate contributors, including Professor V. C. Reddish, Professor Z. Kopal and Professor David Evans, it would have been surprising had the text not been of a high standard. The illustrations—photographs and line drawings—complement the text well, and with nearly 500 pages of lightweight paper packed into the volume of a pocketbook the only notable omissions are those caused by the publication delays.

Not least among the assets of the book is its price, which puts it well within the reach of all serious amateur astronomers. They would be well advised to acquire this book. But even though it is aimed at such readers, not a few professionals (and certainly all astronomy students) are likely to find it valuable for its compact presentation of a wealth of basic data.

John Gribbin

Action at a Distance in Physics and Cosmology. By F. Hoyle and J. V. Narlikar. Pp. x+266. (Freeman: San Francisco and Reading, October 1974.) £7.80.

THE main purpose of this book is to demonstrate that physical facts which are usually explained using field theory can also be explained on the basis of action at a distance between particles.

The book is concerned mainly with electrodynamics (both classical and quantum) and with the masses of particles, which are treated as arising from interparticle action in accordance with Mach's principle. No attempt is made to give gravitation an action at a distance form and the identification of the gravitational field with the metric is retained.

The direct interaction between particles is symmetrical in time, but to this must be added the effects of the 'response' of the rest of the Universe. To be consistent one must obtain a cosmological model in which this response can lead to the usual purely retarded interaction. In the case of the electromagnetic interaction this condition requires that the Universe be a perfect absorber in the future. Of the usual models those satisfying this condition are static universes, the closed Friedmann model, and the steady state model. The static models can certainly be rejected on observational grounds, and most people, including apparently the authors of this book, would now also reject the steady state model. In spite of the statement to the contrary on page 174 (which is based on the misleading principle of taking the Einstein–de-Sitter model as typical of the Friedmann models) the closed Friedmann model also satisfies the response condition for the mass field. The authors, however, reject this model on the grounds that although retarded potentials are consistent, so are advanced potentials, so that the cosmological model does not define the direction of time. Their conclusion is thus that the Friedmann models must be rejected altogether in favour of some more complex model, not specified in detail. If, however, the choice were between abandoning the Friedmann models and deriving the direction of time from some source other than cosmology (such as thermodynamics) then I think most physicists would choose the latter.

I have concentrated on the book's discussion of cosmology, since this seems to be crucial to the whole theory. The book is, however, by no means written solely for cosmologists and it contains much to interest a wider audience. I doubt, thought, that it will convert many to the action-at-a-distance viewpoint.

G. J. Suggett