

hand, that "the world-view of even educated non-scientists has sometimes differed appreciably from that of their scientific contemporaries". Thus the study of non-scientific literature "provides an insight into the diffusion of scientific ideas throughout society as a whole", quite apart from its immediate value for researches in the history of astronomy.

To inject a guiding thread into such comprehensive and wide-ranging material is difficult enough. To a certain degree, however, this is necessary to prevent the possible impression that these fruits of a prolific reading of original literary sources, and of compilations of these, might have been card indexed and afterwards "simply strung together". This is certainly not the case with Meadows's book. Here, he has successfully carved out seven principal clearly defined approaches: the Mediaeval Universe, Time and Instruments, Astrology, the Copernican Revolution, Bacon and Galileo, Newton, and the Victorian Reaction. A valuable appendix of some twenty pages gives, besides a well laid out index, full references to some 450 sources used by the author.

American literature is not discussed in this volume, but mention is made of a recently published annotated bibliography in the *American Journal of Physics* (33, 175; 1965).

It would have been good, however, if use had been made of the magnificent little volume *Dichters over Sterren* by M. G. J. Minnaert (van Loghum Slaterus, Arnhem-Holland, 1949), in which this outstanding and astonishingly versatile astronomer selected some two hundred

pages of astronomy-centred poems (which originated in the Netherlands, Great Britain, the United States, Germany, France and several other countries). Here we find some very fine quotations from Chaucer, Shakespeare, Butler, Byron, Wordsworth, Keats, Shelley and some others, many of which might well have been mentioned in the book under review.

This does not imply a criticism, but rather an encouragement to produce a sequel—both by supplementing the material within the period covered and by extending its scope to earlier times and also to works published in the twentieth century.

Such a selection could then also make use of the collection *A Book of Scientific Verse* by W. Eastwood (Macmillan, London, 1961). Here, a few dozen outstanding "astronomical poems" spring immediately to attention and I should like, too, to see quite a number of these included.

Finally, would it not be splendid if qualified researchers could be induced by Meadows's fine work to extend its linguistic scope, say, by exploring literary-astronomical references in other accessible European languages?

All this should help to bring about another stimulus for regaining—beyond today's fruitful union of astronomy with its sister sciences and technologies—once more the feeling of "oneness with the stars": this wonder of revelation which, with its exhilarating sense of liberation, has become such a rare experience for today's sophisticated man—this very impact of the Universe that was once so overwhelming.

ARTHUR BEER

Physical Sciences

OUR GALAXY

Galactic Astronomy

By Dimitri Mihalas, with the collaboration of Paul McRae Routly. Pp. xiii + 257. (W. H. Freeman: San Francisco and London, January 1969.) 94s.

THE first real insight into the structure of the Milky Way system was gained by Harlow Shapley in 1918 when he demonstrated that the widespread family of globular clusters was centred some 15 kiloparsecs away from the Sun in the direction of Sagittarius. He proposed that this was the centre of the Milky Way in contrast with the contemporary heliocentric picture provided by the Kapteyn Universe which did not take account of the obscuration of the interstellar dust in the galactic plane.

Since that time, our understanding of the structure and dynamics of our Galaxy has progressed a long way. Today we have a picture of a system about 40 kiloparsecs in diameter, rotating about a centre 10 kiloparsecs from the Sun and containing some 10^6 stars of various ages as well as several per cent by mass of interstellar gas and dust. *Galactic Astronomy*, by Dimitri Mihalas, of Princeton University Observatory, in collaboration with Paul McRae Routly, of the American Astronomical Society, describes the present status of the subject suitable for undergraduate and postgraduate teaching; it is a useful self-contained reference work for the professional astronomer.

The book is orientated towards a synthesis of the vast amount of stellar observational material obtained over the years and their interpretation in terms of galactic dynamics which attempts to examine the relation between the space distribution of matter, gravitational forces and the stellar velocity distribution. Observations of the interstellar medium by optical and radio techniques have not been considered to any extent.

One is reminded of the problems which still remain to be solved as well as those for which solutions have been

found. There still is the mystery of the "missing" local matter. An analysis of the velocity distribution of stars perpendicular to the galactic plane leads to a total mass density in the solar neighbourhood which is greater than the known contributions from stars, gas and dust. Best recent measurements indicate that this deficiency of 20-40 per cent is genuine and must be accounted for by such components as low luminosity dwarf stars or molecular hydrogen which have so far gone undetected.

The studies described in the book are principally steady state investigations of the stellar components of the Galaxy. We now know from investigations of neutral hydrogen and of the OH radical at radio wavelengths, however, that this is a far from complete description of the situation in the central regions which can only be investigated at longer than optical wavelengths, namely radio and infrared. Not only are there high radial velocities both inwards and outwards in a region several hundred parsecs in diameter at the galactic centre, but there is in addition a general outward motion of 50 km sec^{-1} at 3-4 kiloparsecs from the centre. These phenomena imply explosive events in the galactic system which at the moment are far from being understood.

As the authors say, the material of the book represents only a beginning in the study of the galaxy. But it is a fascinating beginning and a story well told.

R. D. DAVIES

MARTIAN RESEARCH

The Book of Mars

By Samuel Glasstone. Pp. vii + 315. (National Aeronautics and Space Administration: Washington, DC, 1968.) \$5.25.

ONE may expect that Martian research will shortly enter a new phase of activity when results from the detailed