by a diagram the authors have prepared. They discuss the large-scale structure of the universe, the hidden-mass problem, and the population III stellar objects.

In a paper entitled "Quasars at large redshifts," M. G. Smith (Edinburgh) singles out from among the highly interesting properties of these extraordinary objects the ones most germane to cosmology. Of special significance is the cutoff observed in the quasar redshift distribution. Then comes the quasar distribution in space, and finally, the matter intervening between the observer and the quasars, absorbing their light.

Next A. C. Edwards (Oxford), in "The age problem," examines the age concept itself. Age can be determined by various laboratory methods for solar system bodies – the earth, moon, meteorites. Then one can use the age of globular clusters as a chronometer. The author concludes that the cosmological time scale does not conflict with the ages measured for various objects.

Two papers describe theories of galaxies. K. O. Thielheim (Kiel) has simulated numerically the generation of spiral arms in a galaxy. To judge from the diagrams presented, the match to what we see in the sky is not bad at all, but we still lack a theory to describe such processes. The author in closing discusses a possible mechanism that might produce spiral arms in a galactic disk. S. M. Fall (Cambridge University) analyzes how the morphological type of a galaxy depends on the dimensionless "spin parameter" $\lambda = J|E|^{1/2}G^{-1}M^{-5/2}$, proportional to the galaxy's angular momentum J.

T. Shanks (Durham) devotes a paper to the clustering of galaxies. Analysis of clustering can furnish information on the primordial inhomogeneities in the universe following recombination. As a clustering parameter Shanks adopts a two-dimensional analog of the two-point correlation function proposed by Peebles. This parameter enables the structure of the universe to be studied on large (50-100 Mpc) and small (0.1-5 Mpc) scales. Shanks concludes that the large-scale structure is satisfactorily described by the theory of a homogeneous universe, while the small-scale structure apparently results from hierarchical clumping. The two-point correlation function used by Shanks is, in a sense, a rather poor parameter, as it cannot distinguish between two different patterns: the clumping of galaxies into clusters, and their grouping into long filaments. Hence the author's finding that galaxies are hierarchically clumped, forming clusters of clusters, does not seem very well grounded.

Lastly, in a paper entitled "The most distant galaxies," M. S. Longair (Edinburgh) describes the infrared properties of galaxies which exhibit large redshifts. The brightness of 35 galaxies has been measured in the J, H, K wavelength bands ($\lambda = 1.2, 1.65, 2.2\ \mu$). From these data Longair constructs a color–redshift diagram. He writes that even though his report is preliminary, the material reduced thus far indicates that evolutionary effects manifest themselves substantially more clearly in the infrared than, say, in the optical range.

Translated by R. B. Rodman

Michael H. Carr

The Surface of Mars*

Reviewed by V. G. Surdin

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Measuring $11\frac{1}{4} \times 11\frac{3}{4}$ inches, this book includes 15 tables, some 150 black and white photographs, 20 diagrams and drawings, and a set of photographic maps of the Martian surface. Its 16 chapters are entitled Historical perspective; General characteristics of the surface; The atmosphere; Impact craters; Cratering statistics and crater ages; Densely cratered terrain and plains; Volcanoes; Tectonics and the Tharsis bulge; Canyons; Channels; Wind; The poles; Surface chemistry and the distribution of volatiles; The search for life on Mars (written by Harold P. Klein); Phobos and Deimos; Summary and conclusions. Appendix A briefly describes the specifications of the vidicons carried by the Viking orbiters, the picture sequence planning, and the processing techniques. Appendix B reproduces in black and white the U.S. Geological Survey small-scale map of Mars (except the polar caps) based on orbiter data, and summarizes the status of the larger-scale mapping program as of 1979. A comprehensive bibliography is provided (about 600 references), and an alphabetic index.

*Yale University Press, New Haven, 1981. xi + 232 pp.

The author, Michael Carr, is an acknowledged specialist in planetary mapping. During 1976-1980, the period when the Viking orbiters were scanning Mars, Carr led the Imaging Team and contributed much toward developing the spacecraft television cameras as well as in interpreting the imagery and calibrating the maps. Based on the results of this endeavor, his book is devoted largely to analysis of the pictures of Mars televised from the orbiter modules. This is the first such book to assemble the findings from the Viking missions. Of particular value are the high-quality photographs of the Martian surface, many of them here published for the first time. For nearly every picture the scale is indicated, and in some cases the center coordinates are specified as well.

While the author's main task was to describe the Martian surface – its topography and geological history, the book nevertheless touches to a varying extent upon the whole gamut of Martian puzzles, even that age-old question: Is there life on Mars? In describing the surface features Carr often uses comparative analysis. For example, when discussing the shape of the Martian impact

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