NEWS AND VIEWS

Quasar Redshifts not Intrinsic

It is awkward that quasars seem to prefer certain values of redshift, and even worse that at a quick glance the preferred values seem to show a kind of regularity. Some of them stick out like a sore thumb—the clumping of redshifts around a z-value of 1·95, for example, is undoubtedly real, although to what extent it is an artefact of observational selection is still not certain. M. J. Rees, for instance, has talked of explaining the peak as an effect of quasar evolution which produces an excess of observable quasars at a time in the past corresponding to $z=1·95$. But quasar redshifts take z-values up to just over two and there seem to be other preferred values. What is more, the peaks seem to be more or less equally spaced so that they can be assigned a periodicity. It is of course proving impossible to account for the periodicities on the view that the redshifts are a result of the velocity of recession, unless the quasars belonging to each peak are in clusters with roughly the same velocity, which they palpably are not. The inescapable conclusion has to be that to some extent the redshifts are somehow controlled by conditions close to or actually within the quasars themselves. Nobody has much idea of what the mechanism could be, which is why the periodicities go very much against the grain. Now what seems to be the most convincing analysis of the redshift data yet has been carried out at Cambridge (see page 875), and there seems to be no statistical evidence for regularities in the data.

The point is that the search for periodicities in the redshift data is the same problem as the detection of a signal almost blotted out by random noise, and the same techniques can be used One of the Cambridge group, S. H. Plagemann, has been using a method which electronics engineers call power spectrum analysis to pick out periodic variations in the light from stars, and the method has now been adapted to the redshift problem. The starting point of the method is to consider the redshift distribution as a "time series". C. L. Cowan was the first to do this, but his approach can be criticized (and so could that of G. Burbidge, who has also claimed red-shift periodicities) because the proper statistical tests for significance were not applied. This has now been remedied by the Cambridge group. They have found that at the 95 per cent confidence limits the periodicities picked out by their power spectrum analysis are not significant.

Up to now the application of power spectrum analysis to the quasar problem has been difficult chiefly because it has an unnerving tendency to indicate false periodicities when only small amounts of data are available. But, with 186 redshifts now listed, the Cambridge group believe they are on firm ground. The conclusion is that there is no evidence that quasar redshifts are intrinsic.

PLANETS

Contour Map of Mars

from our Astronomy Correspondent

One way of constructing a topographic map of Mars is to measure the thickness of the atmosphere at various places, and a refinement of this approach has now been tried by R. A. Wells at Kitt Peak (*Science*, **166**, 862; 1969), who has produced a convincing map of an area of Mars between latitudes 50° north and 40° south and from longitude 150° to about 350°. The technique is to see how the abundance of carbon dioxide varies over the surface. From the abundance measurements, the height of the surface above an arbitrary datum is established. The first results from the new method were published in *Science* last month by M. J. S. Belton and D. M. Hunten, who examined a patch from longitude 260° to 350° and between latitudes 40° north and 20° south (**166**, 225; 1969). Wells has now used the spectrophotometer devised by Belton and Hunten for the McMath solar telescope at Kitt Park National Observatory to cover about half of the dark areas on Mars. It is pleasing that his map agrees with that of Belton and Hunten where they overlap, and with radar measurements along latitude 21° north.

What is odd about the dark markings on Mars, of course, is that for the most part they are confined to a band just to the south of the martian equator, and that they seem to have nothing in common with the dark maria of the Moon. This much is clear from Mariners 6 and 7, which in general failed to detect any differences in terrain between light and dark areas (see *Nature*, **224**, 750; 1969). Orthodox opinion is that the distinction has to do with a difference in elevation.

Wells concludes on the basis of his results that there is no apparent correlation between albedo and height. The dark areas framing the desert Hesperia, for example, slope from 22 km above datum at the edge of Hesperia to 12 km where they meet the desert area Ausonia. Because of the thinness of the atmosphere especially above high regions, however, heights above about 10 km have to be taken with a pinch of salt, and clearly the general trends are more reliable than the absolute values. But the data agree with the elevation differences of up to 15 km found by the radar method.

Wells finally sets the cat among the pigeons by pointing out that when scaling factors have been taken into account, the sizes of the basins and of the high blocks on Mars are strikingly similar to terrestrial ocean basins and continents. Clearly the large elevation differences are going to pose all sorts of questions about mountain-building processes on Mars.