NEWS AND VIEWS

Background X-rays and Hierarchical Universes

THE cosmic X-ray background radiation is of great interest to cosmology at present, the critical question being whether this radiation arises from the overall radiation of unresolved galaxies, or whether it arises in intergalactic space, possibly from the Compton scattering of high energy electrons on the "black-body" background photons.

In this issue of *Nature* (p. 1170), A. M. Wolfe and G. R. Burbidge attempt to reconcile the observed lumpy distribution of matter in galaxies with the latest measurements of the isotropy of the smooth X-ray background. The observations from which this work stems come from an experiment on board the OSO-III satellite, and are reported by D. A. Schwartz in *Astrophysical Journal* (**162**, 439; 1970). Schwartz has found that there is no evidence for any anisotropy in the 7·7–38 keV X-ray distribution which could not be explained by motion of the Earth at 800 km s^{-1}, relative to a frame in which the background X-rays are completely isotropic. Further, there is no evidence for a contribution from the halo of our galaxy amounting to more than 3 per cent of the total.

Wolfe and Burbidge argue from these observations that superclusters of galaxies, which have been postulated by proponents of hierarchical universe models, must definitely be ruled out, because they would produce greater anisotropy in the background X-radiation than the observations allow. Even if the radiation originates between the galaxies, it is presumed that the high energy electrons interacting with low energy photons to produce the radiation must themselves originate in galaxies, and thus introduce some degree of anisotropy. Thus, for the scale of proposed superclustering (as many as 10^6 galaxies associated over a region of $\sim$50 Mpc), contour maps of the X-ray emission should resemble those of galaxy distribution. That they do not seems a powerful argument against the existence of superclusters, in spite of the great deal of marginal evidence which has attracted some observers to the idea of a hierarchical universe in which the clustering of stars and galaxies is extended through superclusters of galaxies and super-superclusters. But even with the ejection of fast electrons from galaxies producing a smeared out X-ray distribution from interactions in intergalactic space, there are problems still to be solved. It is likely that the mean free path of an electron before such an interaction occurs will be too small to permit the degree of smearing out required to fit Schwartz's observations. Seemingly, cosmologists must either resort to the standby explanation that all inconvenient observations arise from processes which took place when the universe was substantially different, so that they cannot be expected to fit in with our present picture of the universe, or provide a new class of sources, relatively near to us (that is, with redshift $z < 1$), distributed more evenly than in normal galaxies, and emitting strongly in the X-ray bands but weakly at optical frequencies.

One argument which will certainly be put forward is that if it is acceptable to explain the X-ray background by pulling a new kind of source out of the hat, then it should also be allowed to produce a similar explanation of the microwave background, thus restoring the steady state cosmologies to a position of prominence.

Apart from the removal of hierarchical models from the stage, this latest work seems to answer few questions while raising many points which will be contentious in the coming months. But it is clear that X-ray astronomy is coming into its own in the study of the universe, rather than just our own galaxy, and that it will provide an invaluable source of information about the large scale distribution of matter in the universe once an unambiguous interpretation of its origins can be found.

Unmaking Otiose Proteins

PERHAPS because proteins are much more stable in the cell than are nucleic acids, little attention has been devoted to their demolition *in vivo*, compared with the much greater interest about how nucleic acids are enzymically degraded. Indeed, almost nothing has been known hitherto about the metabolic fate of unwanted proteins. In this issue of *Nature*, however, are the first reports that *Escherichia coli* possesses