A program of work is underway involving the improved characterisation of protein crystals, grown in microgravity and on earth, and the monitoring of the process of crystal growth. Characterisation techniques include detailed mosaicity and topography measurements, which has involved use of SRS, ESRF and NSLS synchrotron X-ray facilities. Monitoring of the crystal growth process is being done via CCD video and interferometry (the latter to follow refractive index changes). Assessment of microgravity versus earth based methods is made possible by use of ESA's APC flown on the NASA Space Shuttle. Improved quality of lysozyme crystals grown in microgravity (by dialysis) has been demonstrated. Aporopurinylcyclamin (growth by vapour diffusion) shows an improvement although not as marked. Comparison of methods of crystal growth, including CCD video monitoring of motion of crystals shows that dialysis methods are superior to vapour diffusion for microgravity crystal growth. A depletion zone around each growing aporopurinylcyclamin crystal is seen in the video data. The X-ray diffraction characterisation can be summarised via plots of mosaicity versus peak reflection height which allow sensitive diagnosis of improved perfection. Correlation of topographic mosaic block size can be made with the rocking curves of the microgravity crystals. The combination of diagnostic techniques and perfection analyses is giving better insights into the optimum conditions for protein crystallization for the realisation of the best signal-to-noise ratio in X-ray reflection intensity measurements.