ty, radius, surface gravity, mass) and of the nebular envelopes (electron temperature and density, total mass, abundances, expansion velocity).

(2) Selected planetaries with unusual characteristics. Study of individual objects which are important for answering the questions given above: for instance nebulae having unusual morphology (multiple envelopes—e. g. NGC 6543; filaments and condensations—NGC 7293; bipolar structure—M 2-9) and unusual central stars (binary and variable stars—UU Sge, FG Sge, NGC 3132, etc.; stars of extremely low luminosities; nuclei not yet detected—NGC 6302).

(3) Planetary nebulae in LMC and SMC. New data would be used to locate the planetary nuclei in the H.-R. diagram and to improve our knowledge on the evolutionary sequence of PN. Stars of low luminosities (up to $M_V \approx 8^m$) will be detected. The space density and the local birth rate of PN in the Clouds could be determined. This programme would be time-consuming and could only be started during the first ten nights at the VLT.

Very important programmes could also be prepared on objects of the solar system, especially on comets. I would probably save one or two nights of the allotted observing time for measuring **comets at very large distances from the sun.** Spectroscopic and photometric observations of the behaviour of cometary emissions beyond 3 A.U. as well as of the continuum at distances up to 20–30 A.U. would be essential for understanding the nature of these bodies.

To plan observations is as easy as it is difficult to plan discoveries. I am sure that not only better and more accurate observational data, but also many unexpected results and discoveries will be obtained with the VLT.

Observations of High Redshift QSO's

J.P. Swings and J. Surdej

Time-consuming observations with existing large telescopes have shown that the spectra of quasi-stellar objects are exceedingly complex. A VLT is needed to obtain the highest spectral resolution and to study in detail the numerous absorption lines. Drs. Jean-Pierre Swings (Institut d'Astrophysique in Liège, Belgium) and Jean Surdej (ESO) would like to use their nights to investigate the nature of some of the most distant objects in the universe.

Spectroscopic observations of a large number of quasars reveal absorption lines whose redshift is smaller than that measured for the emission lines. This observational fact leads to the question as to whether the absorptions originate in material at cosmological distances (cosmological hypothesis) or are associated with matter initially expelled from the quasar itself (intrinsic hypothesis). It also appears that the richness of the absorption spectrum of QSO's increases markedly above redshifts $Z_{em} \simeq 2.2$ so that these objects have exceedingly complex spectra. It is as if there were a threshold for the presence of absorbing material at redshifts $Z_{em} > 2$. Only a VLT would enable one to survey a homogeneous sample of such faint quasars in a reasonable amount of time and with a sufficiently high resolution. Indeed, the absorption lines in QSO's normally appear sharp at the instrumental resolution and strong features tend to split up into multiple, discrete components with an increasing resolution. For some of the brightest QSO's observed so far, resonance doublet absorption lines have turned out to have multiple components corresponding to velocity shifts of a few tens up to a thousand km/sec. The limiting sharpness of these absorption components will probably be reached when using a high resolving power spectrograph which requires a very large light collector.

Strong arguments in favour of the intrinsic hypothesis are given by the observations of P-Cygni line profiles in high redshift QSO's such as PHL 5200, RS 23, etc. For these QSO's the resonance lines of C IV, Si IV, N V, Lyα, ... exhibit profiles which may be interpreted in terms of a spherical envelope decelerated by the gravitational field due to the QSO's core. In turn, this enables the determination of important physical parameters such as the mass of the QSO's core. The intrinsic hypothesis is also supported by noticing that for some quasars the absorption and emission redshifts are correlated via a function depending on atomic data (e.g. line wavelength, continuum wavelength). The mechanism ("line-locking") leading to such a configuration of redshifts is the following: matter radiatively expelled from the QSO's surface is accelerated until there is a drop in the continuum it absorbs, because of Doppler shifts. This drop in the continuum may be due to a continuum edge or to the presence of a strong absorption line of another ion. Finally this causes the ejected matter to be stabilized at some discrete velocities. High resolution spectroscopy achievable with a VLT would allow to study many more cases supporting this mechanism of intrinsic origin.

Repeated observations should be performed to search for variability of the absorption features which would provide further arguments in favour of the intrinsic hypothesis. In addition, if the absorption lines are formed in material close to the quasar, then the excited fine structure states will be populated and the corresponding lines would become detectable.

The large photon-collecting capability of a VLT should also be used for observing occultations of QSO's in order to attempt to detect the presence of Lyα circum-quasi-stellar halos predicted in the intrinsic hypothesis and to determine velocity fields, excitation distribution, etc. in the case of QSO's whose spectra show P-Cygni line profiles.