Abstract

Our aim in this thesis is to use the clustering of QSOs to investigate large-scale structure and cosmology. We are particularly concerned with estimating the cosmological parameters which govern the evolution of structure in the Universe.

We first investigate how QSOs trace the distribution of 'normal' galaxies by measuring the correlation between a sample of ~ 150 QSOs and faint, $b_{\rm J} < 23$ galaxies. At $z < 1.5$ we find that the cross-correlation amplitude is marginally negative. This low signal clearly rules out models in which QSOs inhabit rich environments. The environments of QSOs are more similar to those of *average* galaxies. The slight negative correlation can be explained by gravitational lensing, but this has no effect on our conclusions concerning QSO environments.

We determine the clustering properties of a combined sample of > 1500 QSOs including the LBQS and Durham/AAT QSO surveys. This data set has a clustering amplitude $\bar{\xi}(10\ h^{-1}\ \mathrm{Mpc}) = 0.83 \pm 0.29$ for $\Omega_0 = 1$ at $\bar{z} = 1.27$. On $\sim 100 - 1000\ h^{-1}$ Mpc scales the limit on detected signals in ξ is ± 0.025. A model of clustering evolution which includes the effect of bias was used to compare QSO clustering to the clustering of low redshift galaxies and Seyfert galaxies. If Seyferts and QSOs are similarly clustered, then the data prefer a low Ω_0 or high bias for QSOs and galaxies. In contrast, comparisons to the CMB measurements of *COBE* assuming a CDM-type power spectrum suggest low bias. This might be taken as evidence for low Ω_0, but the data is still consistent with $\Omega_0 = 1$ and $b_{\mathrm{q}\rho} \simeq b_{\mathrm{g}\rho} \simeq 2$. We consider the possibility that nearby galaxy clusters can gravitationally lense background QSOs. We apply the lensing hypothesis to the result of Boyle et al., (1988) and find that cluster masses required are too large. A small dust component could retrieve the lensing model and allow more reasonable mass estimates for clusters from this method.

The requirement for a new, deep, wide-field, QSO survey is clear. We discuss the construction of the candidate catalogue for the 2dF QSO Redshift Survey, which will contain ~ 25000 QSOs. We calibrate the photographic plates used for the candidate catalogue and assess the sources of errors and incompleteness. From preliminary spectroscopic observations we conclude that the completeness of the 2dF catalogue is $\sim 71.1 \pm 7.1\%$, compared with an estimated completeness of $\sim 80\%$. We propose to substantially increase the catalogue completeness (to $\sim 90\%$), by the introduction of UKST r plates into our candidate catalogue.

Preface

The work described in this thesis was undertaken between 1993 and 1997 whilst the author was a research student under the supervision of Dr. T. Shanks in the Department of Physics at the University of Durham. This work has not been submitted for any other degree at the University of Durham or at any other University.

The majority of the work contained in this thesis is the authors own. The research contained in Chapters 4 and 6 was carried out as part of the 2-degree Field Quasar Redshift Survey in collaboration with R.J Smith, T. Shanks, B.J. Boyle, L Miller and M.A. Read.

A number of the results presented here have appeared in the following papers :

Croom, S.M., Shanks, T., Boyle, B.J., (1995), in Maddox, S.J., Aragon-Salamanca, A., eds, *Wide-Field Spectroscopy and the Distant Universe (35th Herstmonceux Conf.)*, World Scientific.

Croom, S.M., Shanks, T., (1996), *MNRAS*, 281, 893.

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Scott

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