# OBJECTIVE-PRISM GALAXY REDSHIFTS IN FIELDS AROUND THE SOUTH GALACTIC POLE

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## ABSTRACT

Measurements made with the COSMOS machine on deep objective-prism photographs taken with the UK 1.2m Schmidt Telescope are being used to obtain approximate redshifts (accurate to $\sim 0.01$ in z) for large numbers of galaxies in fields near the South Galactic Pole. The data are suitable for investigations of the distribution of galaxies, such as the detection of large-scale density enhancements or voids.

## 1. INTRODUCTION

Cooke et al (1984, these proceedings) have described a technique for obtaining approximate redshifts for galaxies from low dispersion (resolution of 2480Å/mm at Hγ) objective-prism spectra. The technique relies upon the accurate measurement of the position of the emulsion cut-off (taken as a wavelength standard at $\lambda$ = 5380Å for the unfiltered IIIaJ emulsion) and the position of the so-called "4000Å feature" (at $\lambda$ = 3990Å) which changes relative to its rest wavelength position with redshift. This 4000Å feature is only present in the spectra of elliptical and early-type spiral (up to type Sb) galaxies. Redshifts can only be reliably obtained for those galaxies with a reasonably well defined 4000Å feature and in a limited magnitude range (16<=B<=19). The advantage of the technique is that when properly applied, the method can yield redshifts for some thousands of galaxies from a single UK Schmidt Telescope (UKST) objective prism plate. Unfortunately, the measurement accuracy ($\Delta z = 0.007$ at $z = 0.02$, $\Delta z = 0.013$ at $z = 0.20$) is insufficient to enable detailed properties of the galaxy distribution to be investigated or cluster velocity dispersions to be determined. However, the results do enable such studies as the detection of large-scale density enhancements and voids, the 3-dimensional distribution of clusters



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and the verification of Bautz-Morgan (1970) classification. The latter has important consequences for the analysis of cluster redshifts, since many published redshifts rely on measurements of the brightest cluster member only, and may be incorrect in some instances (see e.g. Sarazin et al 1982).

We are currently using the technique in order to obtain redshifts for galaxies and clusters in several fields around the South Galactic Pole (SGP). The aim of this investigation is to provide a systematic survey which can be used for statistical studies of the distribution of galaxies and clusters, and searches for the presence of large-scale agglomerations in the matter distribution. To this end the survey is being carried out in conjunction with the faint galaxy survey from direct photographs (MacGillivray and Dodd 1984, these proceedings).

## 2. METHODS

At present, galaxy redshifts are obtained using an interactive procedure. This interactive processing is inefficient for the analysis of large areas of plate and is soon to be replaced by a completely automatic technique (Cooke et al 1984, these proceedings). This has meant that we have been restricted in the past to small areas of plates such as individual rich clusters of galaxies and small field areas.

Data are obtained from COSMOS in its mapping mode of measurement (MacGillivray 1981), with a pixel size of 16μm, on UKST objective-prism photographs. Rich clusters are identified from isoplethal maps of the distribution of galaxies on the direct plate. Areas surrounding the clusters in the data are extracted as 512 x 512 element picture arrays which are then processed using techniques which are described in detail by Parker et al (1982). The arrays are displayed on a colour monitor as digitised images (see Figure 1 of Clowes et al 1984, these proceedings), the spectra of galaxies (which are identified on the direct plate) are selected, the 4000Å feature identified with a cursor and the redshift obtained.

## 3. RESULTS

The southern sky survey field number 349 (with 1950 coordinates 00h 00m, 35°00') is interesting because of the large number of rich clusters it contains. Many of these can clearly be seen in the isoplethal map of the field (figure 1) for galaxies down to B = 21.8. In figure 2 we show the results obtained for the rich cluster to the East of the plate centre. This cluster has been studied by Carter (1980) who obtained a redshift of z = 0.114 for the central cD galaxy. In figure 2 we see that the peak reshift in the direction to the cluster is in the range 0.11-0.12, in good agreement with the redshift from slit spectroscopy. Several other clusters in this field likewise have peak redshifts in this range indicating that

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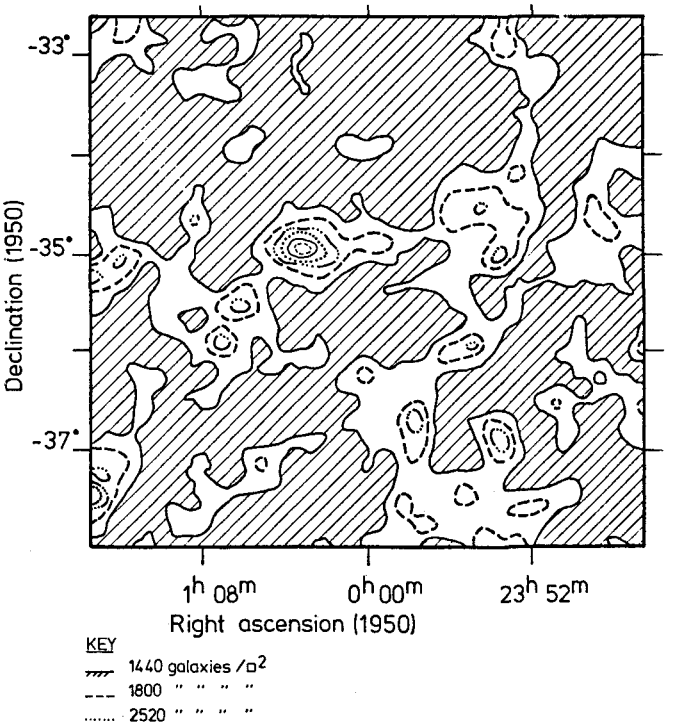


Figure 1 The distribution of galaxies down to B=21.8 in the southern sky survey field 349. Several rich clusters may be seen from the isopleths.

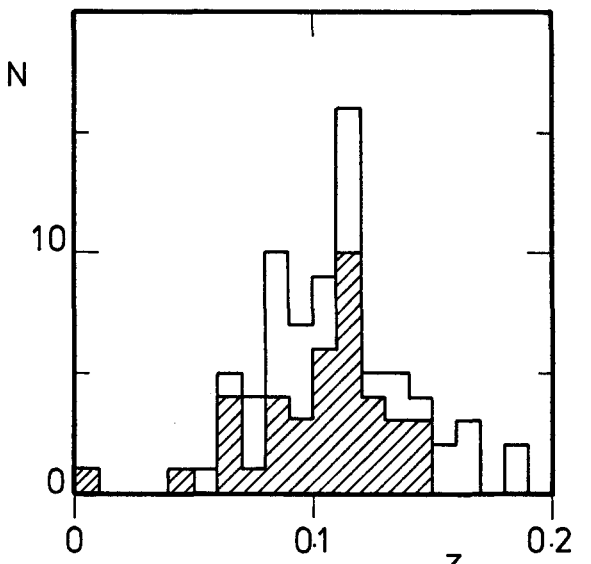


Figure 2 Histogram showing the redshifts for galaxies in the direction to the rich cluster at 00h 03.5m, -35°. The filled histogram indicates galaxies for which a high degree of confidence has been attached to the identification of the 4000Å feature.

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they may form part of a large-scale structure extending over much of the field.

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