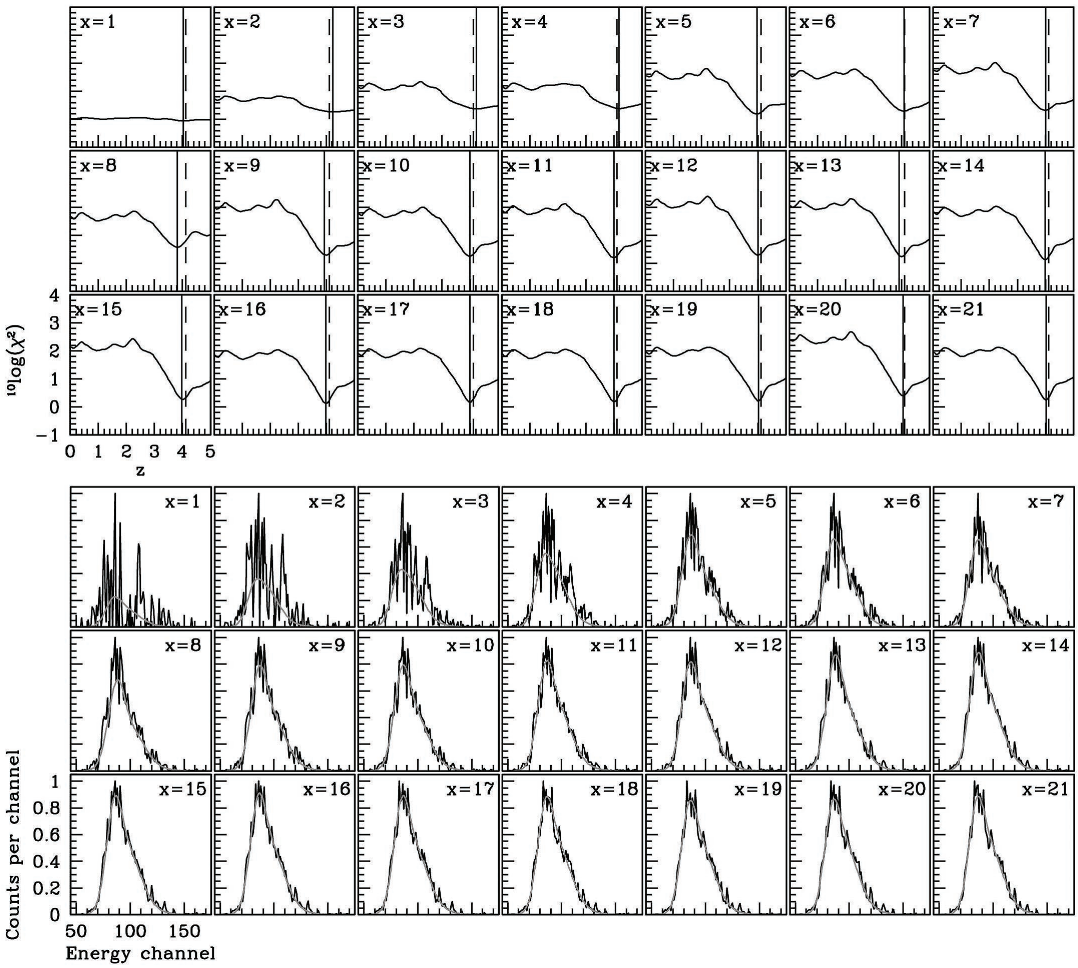

Figure 3. Top: $\chi^2(z)$ using the first x = 1,...,21 seconds of data of QSO 0000–263 (z = 4.1). The dashed and solid lines indicate the literature and best-fit redshifts, respectively. Bottom: as top panels, but showing the observed QSO spectra (black) and best-fit models (grey). Panels have differing vertical scales.

The CIRSI-INT IR Survey

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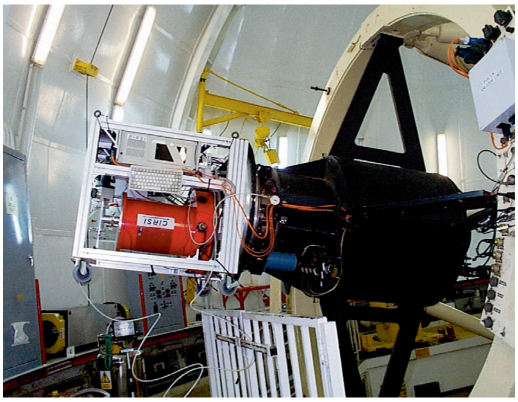
The Isaac Newton Telescope has been used in conjunction with the Cambridge InfraRed Survey Instrument (CIRSI), to undertake a wide area deep IR survey in the *J* and *H* bands. This article gives a brief introduction to the survey and presents some initial results. In the spirit of the INT Wide Field Camera Survey program (Walton et al., 2001; `http://www.ing.iac.es/Astronomy/science/wfs/`; `http://www.ast.cam.ac.uk/~wfcsur/`) we are making reduced data products publicly available. A preliminary data release is planned for April 2002 with a complete release planned in the Summer 2002. The survey observations have been used in conjunction with optical CCD data from the INT Wide Angle Survey to undertake a survey for low and intermediate redshift quasars ($z<3$) free from the potential biasing effect of dust absorption. The results of these observations are reported to illustrate the utility of the survey data for combined optical-IR survey projects.

CIRSI-INT IR Survey

With a field of 4×7.80'×7.80' at the prime focus of the 2.5m Isaac Newton Telescope, the Cambridge InfraRed Survey Instrument, CIRSI (Mackay et al., 2000), is currently the largest field of view IR imager in operation. The camera, a mosaic of 4 Rockwell HgCdTe HAWAII IR arrays, is capable of observing in the *J* and *H* bands at the INT. The physical construction of the detector arrays prevents them being butted together



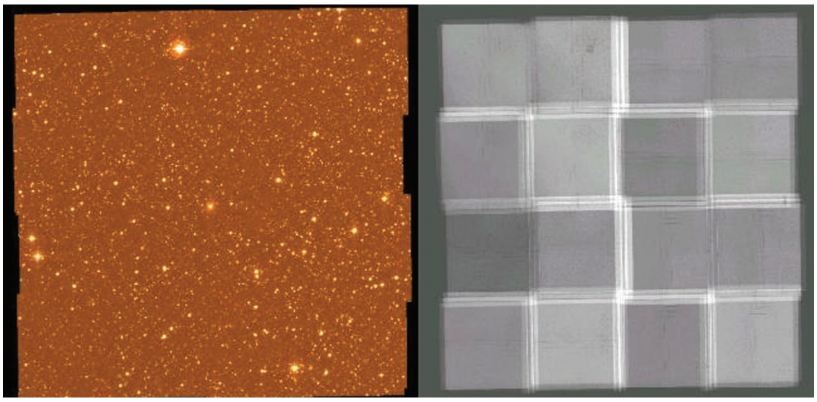


Figure 1 (left). CIRSI at the prime focus of the 2.5m INT. Figure 2 (right). The image to the left is a 29.6'×29.6' mosaic of four poinitngs of the CIRSI camera. To the right the weight map associated with the mosaic is shown.

in close proximity as is normal for optical CCD mosaic cameras. There is a 90% spacing between the elements of the mosaic. Sequential observations are offset to fill the gaps in the mosaic. A 4 pointing tile of observations covers an area of 29.6'×29.6'. Figure 2 demonstrates the camera layout.

The nominal survey depths attained are $J<20.0$, $H<19.0$ roughly three magnitudes deeper than the level attained by the 2MASS project. Details of the fields observed are given in Table 1. The survey observing strategy consists of ~350 sec exposures. Depending on sky brightness conditions during observations the exposure is built up from a sequence of 4 (or 5) dither positions with 4 (or 3) exposures of 22 s (or 30 s) duration at each position. Approximately 5 Gb of data are obtained a night. Data processing is performed using pipeline processing software developed in Cambridge (Sabbey et al., 2001).

INT WAS Data

The fields targeted by the CIRSI-INT survey program are chosen to be coincident with observations from the INT Wide Angle Survey project (McMahon et al., 2001). The INT WAS fields surrounding the ISO ELAIS N1 and N2 fields at 1610+54 and 1637+41 have been extensively observed in the J and H bands and observations have also been undertaken in the J band of the zero declination strips at RAs of 14:55 and 22:08, coincident with the recent data release from the Sloan Digital Sky Survey (SDSS).

Field	RA Dec (J2000)	Depth	Extent
INT WAS ISO ELAIS N1	16:10 +54:30	$J<20.0$, $H<19.0$	7 deg^2
INT WAS ISO ELAIS N2	16:37 +41:16	$J<20.0$, $H<19.0$	7 deg^2
INT WAS NGC	14:52–14:58 +00:00	$J<20.0$	3 deg^2
INT WAS SGC	22:00–22:16 +00:00	$J<20.0$	2 deg^2

Table 1. Survey regions and observational data available. The North and South Galactic Cap regions (NGC/SGC) are coincident with the recently released SDSS zero declination strip observations.

Example Science: Reddening Independent Quasar Selection

It has long been known that absorption by dust, if present either along the line of sight to quasars or within the quasar host galaxies themselves, could bias samples of quasars selected primarily on the bases of ultraviolet excess (UVX). Figure 3 demonstrates the predicted effects of dust reddening on UVX selection of quasars. Two of the quasars identified in the CIRSI-INT sample for which U band observations are currently available do not show a UV excess. There are a number of reasons to endeavor to construct a quasar sample free from a bias against dusty quasars. Two examples are the following:

– There is an apparent lack of high column density ($\log N(HI) > 21 cm^{-2}$) damped Lyman-α (DLA) quasar absorption systems observed with high metallicity (Boisse et al., 1998). If the dust within DLA absorption systems themselves is responsible for reddening quasars then more evolved DLA hosts with higher metallicities could well be expected to exhibit higher dust content and greater dust obscuration of the background quasar, preventing the most evolved DLA systems from being discovered.

– Dust may bias quasar lensing statistics (Kochanek, 1996). If the identification of quasars is biased against objects lensed by dusty lenses then any model associated with the population of lensed quasars is also biased. Recently multiply imaged lensed quasars have been used to study the structure of distant galaxies by detailed studies of quasar absorption line systems. If lensed quasar samples are biased against dusty lens then these studies will only investigate systems with little dust.

Figure 4 illustrates the principle of the gzH colour selection technique developed for defining quasar candidates. The principle is similar to the VJK selection method proposed

Pixel scale (arcsec/pixel)	0.46
FOV per chip	7.8' × 7.8'
FOV for 2×2 mosaic	29.6' × 29.6'
Frames/deg^2	16
J, 5min 5σ in 1.2" seeing	20.0
H, 5min 5σ in 1.2" seeing	19.0

Table 2. CIRSI Characteristics on 2.5-m Isaac Newton Telescope.

by Warren, Hewett & Foltz (2000), however, observations are required in only one *IR* band. A preliminary quasar identification has been undertaken by Sharp et al. (2002). 68 candidate quasar are identified in data taken from a subset of 0.7 deg^2 of the available survey area. Spectroscopic observations of 32 targets have been obtained confirming 22 quasars, a success rate of 65%. Observations are currently available across the *ugrizJ* and *H* bands for a sub set of the quasars identified. The *ugr* colour diagram, analogous to the traditional UVX quasar colour selection scheme, is shown in Figure 3. Two of the newly discovered quasars show no UV excess at all. ¤

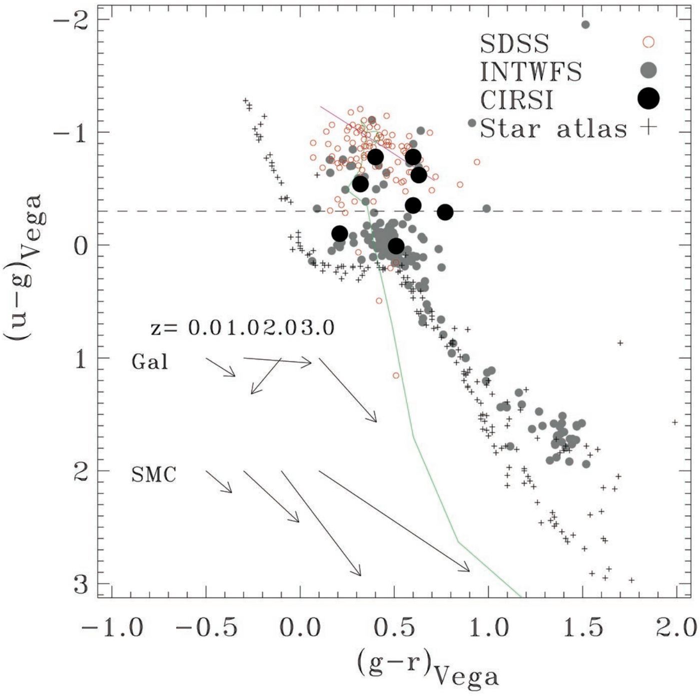


Figure 3. A comparison is shown of a sample of previously known quasars identified in the SDSS. The new quasars identified by gzH selection for which ugr data is available from the INT WAS are marked with filled circles. The horizontal line at u−g= −0.3 represents a UVX selection boundary analogous to that used in the 2dF quasar survey (2QZ Boyle et al., 2000). The stellar locus, computed from a spectral atlas, is shown along with stellar objects from a field of the INT WAS. The locus of quasar colour as a function of redshift is indicated by the solid line. The onset of absorption in the g band, due to the Lyman-α forest, is evident for quasars with z>3. Reddening vectors for dust models based on the Galaxy and the Small Magellanic Cloud are shown over a range of redshifts. The 2175Å feature in the galactic law passes through the g band over the range 1<z<2.

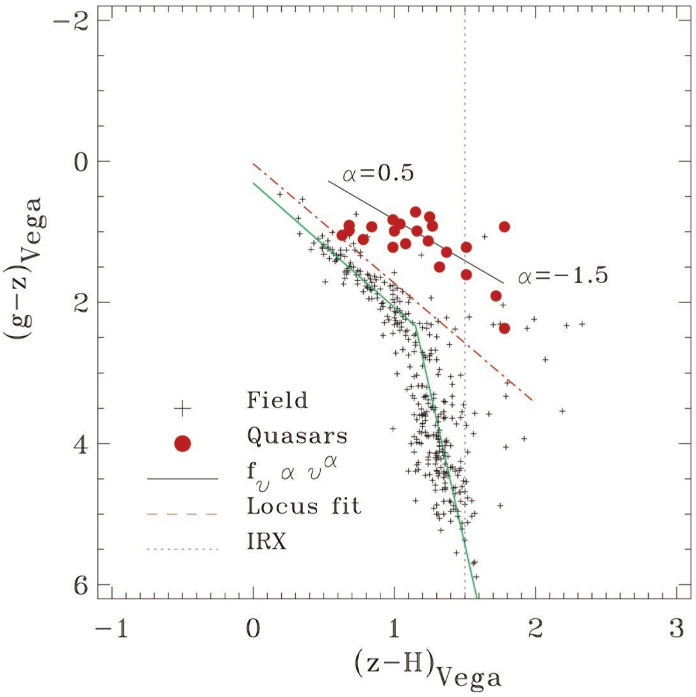


Figure 4. The candidate selection diagram for a 0.17deg^2 region of the survey is shown with the full quasar sample overlaid. The selection boundary, chosen based on model quasar colours, is indicated by the broken line offset from the linear fit to the stellar locus.

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