higher for the popular 'flat' cosmological models favored by inflationary scenarios for the early Universe.

This discovery therefore confirms very directly the earlier indication from the existence of quasars out to z ~ 4.5 that at least some galaxies must have formed at z > 4.5. This is rather earlier than is expected in some popular theories of galaxy formation. It will be interesting to see whether more such objects are found, or whether old galaxies such as 0902+34 are infact very rare at z > 3. Early reports circulating in the community suggest that many more such objects, some even more distant than 0902+34, are now being seen by other researchers.

While much work remains to be done, both on this galaxy and on finding other similar objects, the discovery is exciting because it represents the first time that a population of stars has been identified this far back in time. This is the first time that we have been able to study a galaxy at a redshift that is sufficiently high that it corresponds to an epoch close to that time in the early Universe when major phenomena, such as galaxy formation, the peak comoving density of quasars and so on, are expected to be occuring.

S. Lilly

New Insights on the Gravitational Lens System 2237 + 030

This system was first proposed as a gravitational lens candidate by Huchra et al. (1985, A.J., 90, 691) when they discovered a QSO at z = 1.695 at only 0".3 from the core of the Zwicky galaxy 2237+030 at z = 0.0394. The QSO was latter observed to have at least two components by Tyson (1986, IAU Symp. 119, p. 551).

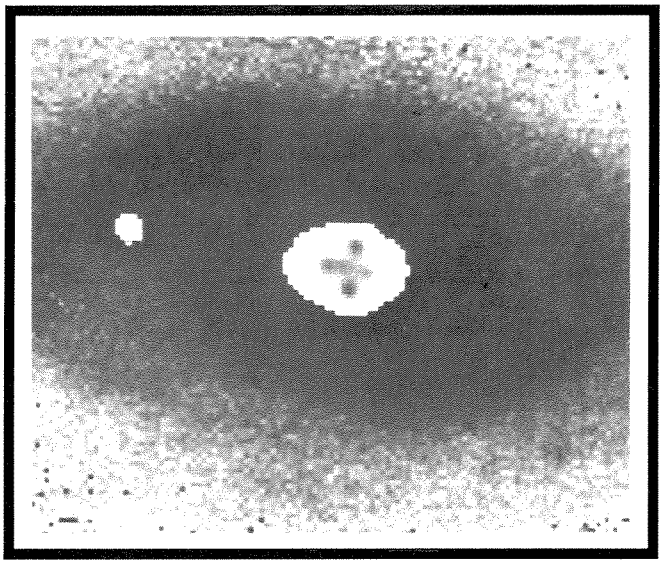

Figure 6: CCD image of the gravitational lens system 2237 + 030 obtained through an i (8000 Å) filter at the prime focus of the CFHT under a 0".65 seeing FWHM. The scale is 0".206 pixel and the separation between the two brightest components is 1".8. The image is displayed in a logarithmic scale with a single wrap-around to show both the lensing galaxy and the 4 lensed quasar components.

Recent photometric and spectroscopic observations obtained at CFHT add important new information to confirming the gravitational lensing hypothesis.

First, direct images were obtained by H. Yee from University de Montreal on 25 September 1987 at the CFHT prime focus RCA4 CCD. Images in i, r and j bands were obtained with seeing of 0".65, 0".90, 0".75 respectively. Under this superb seeing, 4 components were observed at the QSO location with a 1".8 separation between the brightest ones (figure 6).

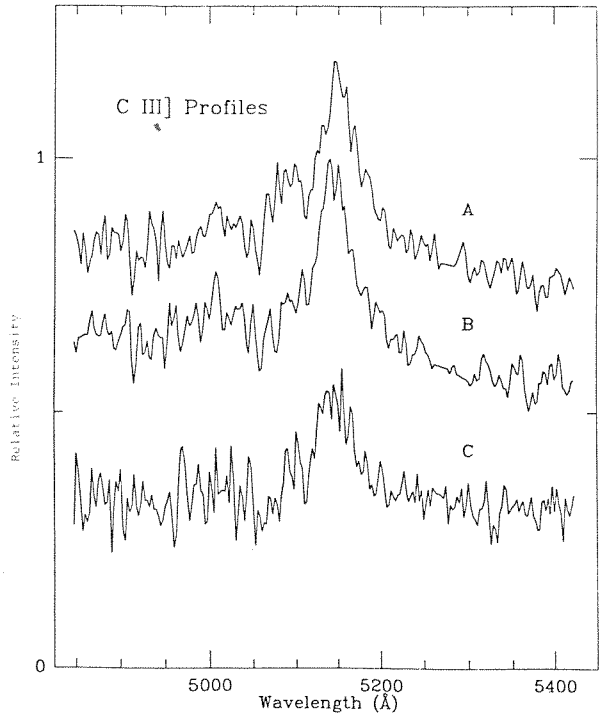

Figure 7: CIII] λ 1909 Å emission line spectral region for components A, B, and C. Data have been smoothed with a 2 point moving average filter. Component A has been arbitrarily shifted in intensity to avoid crowding. Profiles are the same to within errors.

Then, De Robertis and Yee observed the system with the Herzberg Spectrograph at the Cassegrain focus on 16 November 1987. Two slit positions were used to isolate only 2 components at a time, and an average seeing of 1" allowed them to show the similar structure of the CIII emission line for the 3 brightest components (figure 7, De Robertis and Yee, submitted to ApJ letters).

These new observations confirm that 2237 + 030 is indeed a gravitational lens system with the most unambiguous evidence for the lensing galaxy to date.

H. Yee