

DEEP HST IMAGING OF A GALAXY CLUSTER AT $z=2.40$

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We present a 67-orbit HST/WFPC2 exposure on the weak radio galaxy 53W002 at $z=2.390$ and its surrounding cluster. Color Plate 1 shows 12 orbits in I_{F814W} & V_{F606W} , and 24 in B_{F450W} . Potential cluster members were identified through 15 orbits in $F410M$, optimized for narrow-band searches for compact $Ly\alpha$ objects at $z \simeq 2.4$ (P96), and confirmed through spectroscopy (W91, P96); 16 candidates were found with significant narrow-band emission in $F410M$: 4 out of 5 had a confirming MMT spectroscopic redshift at $z \simeq 2.40$ (P96). All are located within $60''$ from 53W002, or $\sim 0.24 h_{100}^{-1}$ Mpc ($q_0=0.5$) at $z \simeq 2.4$, the physical scale of a group or small galaxy cluster. One object contains a weak (variable) AGN, another is a merger with two companions. Their underlying young stellar population is very compact, with $r_{h.l.} \simeq 0.2''$ ($\simeq 0.8 h_{100}^{-1}$ kpc), and considerably fainter than the L^* -value at $z \simeq 2.4$, implying sub-galactic sized objects. These results may explain why ground-based $Ly\alpha$ searches for PG's have been largely unsuccessful. The narrow-line galaxy 53W002 was imaged in the PC at $\sim 0.07''$ FWHM (WK95, see also W94). Its AGN component is $\leq 20 \pm 4\%$ of the total continuum, surrounded by an extended $r^{1/4}$ -envelope with $r_{h.l.} \simeq 1.1''$ (4.3 kpc), and has an SED of ~ 0.3 Gyr in the center to ~ 0.5 – 1.0 Gyr at ~ 4 kpc. A *one-sided* cloud is seen ~ 1.8 kpc West, ~ 0.3 mag bluer than the SED, aligned with the radio source and its $Ly-\alpha$ cloud, presumably weak scattered AGN light, and/or jet-induced star-formation.

References

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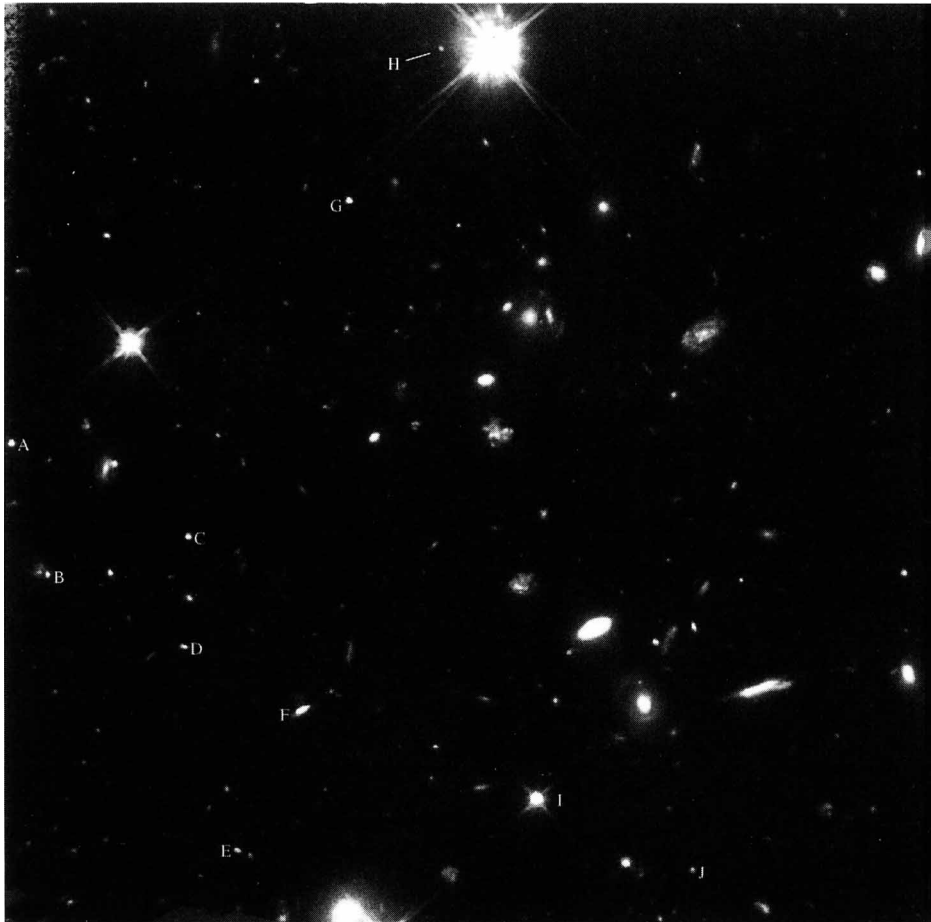


Plate 1. True color image of our 48-orbit Cycle 4-5 HST/WFPC2 exposure in *both* B_{F450W} (16 hours; blue gun), V_{F606W} (5.7 hours; green), and I_{F814W} (5.7 hours; red). V was rotated by -6.721° to match the B - and I -exposures, resulting in slanted borders. North is 39.7° counterclockwise from vertical. This WFPC2 image is $64 \times 64''$, has $0.07''$ resolution (FWHM) and a $3\text{-}\sigma$ point source sensitivity of $R \cong 29.3$ mag. Objects labelled A, B, C, etc., are candidate cluster galaxies at $z \cong 2.40$ with significant excess in the WFPC2 $Ly\alpha$ filter (Pascarella *et al.* 1996). Object 53W002 (not visible here) plus object A, B, and E are spectroscopically confirmed at $z \cong 2.40$.