CHARACTERISTICS OF NEBULOSITY ASSOCIATED WITH PARKES QUASARS

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A sample of 13 out of 15 low redshift ($0.1 \leq z \leq 0.6$) radio-loud quasars have been resolved on large-scale (19 arcsec mm^{-1}), sky-limited ($\mu_R \sim 26.5$ mag sec^{-2}) Kodak IIIa-F photographs obtained with the ESO 3.6-m telescope. The QSO images were analyzed by digitally subtracting the plate background and the point-spread function defined by images of nearby ($\lesssim$ 1 arcmin) field stars having magnitudes comparable to the quasars ($\Delta m \lesssim 0.3$ mag). The resolved nebulosities underlying the QSO images have isophotal diameters in the range $\theta \sim 7$ to 40 arcsec, with surface brightnesses $\mu_R \sim 22$-26 mag sec^{-2}, and integrated apparent red magnitudes $\sim$ 16-21.

For the 13 resolved quasars, the nebulosity was found to have an average metric diameter, $\langle M_R \rangle \sim -21.8 \pm 0.8$, assuming $z_{neb} = z_Q$ cosmological, $H_o = 60$ kms Mpc^{-1}, and $q_o = +1$. The isophotal diameters of the resolved nebulosity are correlated with quasar redshifts, where $\theta \sim z^{-1}$ within the observational errors. The integrated apparent red magnitudes and the isophotal diameters are also correlated where $R \sim -5 \log \theta$ + constant within the observational errors. The correlations are indicative of roughly constant linear diameters and constant surface brightnesses for the associated QSO nebulosities. The redshift-magnitude relation for the underlying nebulosity can be interpreted as a Hubble law with the integrated absolute magnitudes of the nebulosity being $\sim$ 2 mag fainter than first-ranked giant elliptical galaxies, with a dispersion in absolute magnitude of $\sim$ 3 mag.

The physical and statistical properties of the nebulosity surrounding the quasars inferred from the observations lend significant support to the hypothesis that quasars are the luminous nuclei of distant galaxies. The observations further suggest that: 1) quasars are the nuclei of galaxies of average luminosity; and 2) the quasar nuclei are considerably more luminous relative to their host galaxies than other types of active galactic nuclei.

Further imagery of two high redshift quasars, analyzed in the same manner, but not part of the above sample, exhibit unresolved images at $z = 1.048$ and $z = 2.568$.

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Reference:
Wyckoff, S., Wehinger, P. A., and Gehren, T., 1981, Astrophys. J., 247, 750.

DISCUSSION

ABELL: What are the redshifts of the two quasars where nebulosity was not detected optically?

WEHINGER: Out of 15 QSO's (z = 0.158 to 0.528), the two not resolved were among three of the highest redshift objects in our sample. One was at z = 0.361, the other at z = 0.528.