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From the Editor

The Active Galaxies Newsletter is produced monthly. The deadline for contributions is the last friday of the month. The Latex macros for submitting abstracts and dissertation abstracts are appended to each issue of the newsletter and are also available on the web page.
Matt Redman

Abstracts of recently accepted papers

Below the Lyman Edge: UV Polarimetry of Quasar

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The Lyman edge at 912 Å is an important diagnostic region for studying quasi-stellar objects (QSOs). In particular, it reveals a great deal about the physical conditions within the atmospheres of accretion disks, a ubiquitous component of QSO theories. A robust prediction of accretion disk models is a significant polarization due to electron scattering just longward (in wavelength) of the Lyman edge because of the wavelength dependence of the Hydrogen absorption opacity. Observations of the Lyman edge regions of QSOs have shown scant evidence for the predicted features—few QSOs show the broad, partial Lyman edges expected to be common according to most theories, and none show the high polarizations expected longward of the Lyman edge. Still, polarization spectra of a small number of QSOs have shown a rising polarization (up to 20%) at wavelengths *shortward* of the Lyman edge. We have now doubled our sample of intermediate-redshift QSOs observed with the *HST/FOS* spectropolarimeter to determine the amount of polarization on both sides of the Lyman limit. For this new sample of six objects, polarizations are low and mostly consistent with zero below the Lyman edge.

Another important result of the new data is that it strengthens the conclusion that quasars are generally not polarized significantly just longward of the Lyman edge at $\sim$1000Å. There is no significant statistical wavelength dependence to the polarization longward of the Lyman edge indicating that simple plane-parallel atmospheres with scattering-dominated opacity are not significant sources of UV flux in quasars.

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The Ultraviolet Spectra of LINERs: A Comparative Study

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Imaging studies have shown that $\sim 25\%$ of LINER galaxies display a compact nuclear UV source. As part of a program to study the nature of LINERs and their connection to the active galaxy phenomenon, we compare the *HST* ultraviolet (1150–3200 Å) spectra of seven such UV-bright LINERs. Data for three of the galaxies (NGC 404, NGC 4569, and NGC 5055) are presented for the first time, while data for four others (M81, NGC 4594, NGC 4579, and NGC 6500) have been recently published. The spectra of NGC 404, NGC 4569, and NGC 5055 show clear absorption-line signatures of massive stars, indicating a stellar origin for the UV continuum. Similar features are probably present in NGC 6500. The same stellar signatures *may* be present but undetectable in NGC 4594, due to the low signal-to-noise ratio of the spectrum, and in M81 and NGC 4579, due to superposed strong, broad emission lines. The compact central UV continuum source that is observed in these galaxies is a nuclear star cluster rather than a low-luminosity active galactic nucleus (AGN), at least in some cases. Except for the two LINERs with broad emission lines (M81 and NGC 4579), the LINERs have weak or no detectable UV emission lines. The UV emission-line spectrum strength shows no relation to the UV continuum strength. Furthermore, at least four of the LINERs suffer from an ionizing photon deficit, in the sense that the ionizing photon flux inferred from the observed far-UV continuum is insufficient to drive the optical H I recombination lines. Examination of the nuclear X-ray flux of each galaxy shows a high X-ray/UV ratio in the four "UV-photon starved" LINERs. In these four objects, a separate component, emitting predominantly in the extreme-UV, is the likely ionizing agent, and is perhaps unrelated to the observed nuclear UV emission. Future observations can determine whether the UV continuum in LINERs is always dominated by a starburst or, alternatively, that there are two types of UV-bright LINERs: starburst-dominated and AGN-dominated.

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Discovery of an Ultra-Steep Spectrum, Highly Polarized Red Quasar at $z = 1.462$

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We report the discovery of WN J0717+4611, a highly polarized red quasar at $z = 1.462$, selected from a sample of faint ($S_{1.4GHz} > 10$ mJy) ultra steep spectrum ($\alpha^{327}_{1400} < -1.3$; $S \propto \nu^{\alpha}$) radio sources. VLA observations at 4.85 GHz show that the radio source is dominated by a 21 mJy core. Using the Keck telescopes, we obtained spectra with a combined wavelength range covering 4000 Å to 1.6 μ m, and spectropolarimetric observations between 4000 Å and 9000 Å. We identify WN J0717+4611 as a quasar based on broad emission of Mg II λ2799 (FWHM $\simeq$ 11,000 km s^{-1}), a stellar R_S-band Lick image and the high luminosity of the object ($M_B = -24.2$). The optical linear polarization is wavelength-ind ependent at 15% in both the continuum and the emission lines, with the polarization angle orthogonal to the radio jet axis. We argue that the polarization mechanism is scattering of quasar light by surrounding small dust grains or electrons. WN J0717+461 1 appears highly reddened for a core-dominated quasar.

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Stellar population in Active Galactic Nuclei. I. The Observations

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Recent observations supported by theoretical models have lead to the view that giant and supergiant stars are over abundant, and/or a high metallicity component may be present, in the stellar populations at the centres of active galaxies. Here we attempt to quantify these effects by observing the strengths of the stellar absorption lines of Mg b, NaI, CaII triplet as well as molecular bands such as CN and TiO. Using long-slit spectroscopic data we are able to separate the stellar populations in and

around the nucleus, for a sample including, normal, LINER, starburst and Seyfert galaxies. In this paper we present the data, namely spectra of the nucleus and of a number of circum-nuclear regions. Comparisons reveal gradients in both the reddening and the stellar population within the central regions of most galaxies. Detailed stellar population synthesis is presented in a companion paper.

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Morphological Evolution in High Redshift Radio Galaxies and the Formation of Giant Elliptical Galaxies

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We present deep near–infrared images of high redshift radio galaxies (HzRGs) obtained with the Near Infrared Camera (NIRC) on the Keck I telescope. In most cases, the near–IR data sample rest wavelengths free of contamination from strong emission lines and at $\lambda_{\rm rest} > 4000$Å, where older stellar populations, if present, might dominate the observed flux. At $z > 3$, the rest–frame optical morphologies generally have faint, large–scale (∼50 kpc) emission surrounding multiple, ∼ 10 kpc size components. The brightest of these components are often aligned with the radio structures. These morphologies change dramatically at $2 < z < 3$, where the K images show single, compact structures without bright, radio–aligned features.

The linear sizes (∼ 10 kpc) and luminosities ($M(B_{\rm rest}) \sim -20$ to -22) of the *individual* components in the $z > 3$ HzRGs are similar to the *total* sizes and luminosities of normal, radio–quiet, star forming galaxies at $z = 3-4$ (Steidel et al. 1996; Lowenthal et al. 1997). For objects where such data are available, our observations show that the line–free, near–IR colors of the $z > 3$ galaxies are very blue, consistent with models in which recent star formation dominates the observed light. Direct, spectroscopic evidence for massive star formation in one of the $z > 3$ HzRGs exists (4C41.17, Dey et al. 1997*a*). Our results suggest that the $z > 3$ HzRGs evolve into much more massive systems than the radio–quiet galaxies and that they are qualitatively consistent with models in which massive galaxies form in hierarchical fashion through the merging of smaller star–forming systems.

The presence of relatively luminous sub–components along the radio axes of the $z > 3$ galaxies suggests a causal connection with the AGN. We compare the radio and near–IR sizes as a function of redshift and suggest that this parameter may be a measure of the degree to which the radio sources have induced star formation in the parent objects. We also discuss the Hubble diagram of radio galaxies, the possibility of a radio power dependence in the $K-z$ relation, and its implications for radio galaxy formation.

Finally, we present for the first time in published format basic radio and optical information on 3C 257 ($z = 2.474$), the highest redshift galaxy in the 3C sample and among the most powerful radio sources known.

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NEW CONSTRAINTS ON THE CONTINUUM-EMISSION MECHANISM OF AGN: INTENSIVE MONITORING OF NGC 7469 IN THE X-RAY AND ULTRAVIOLET

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We have undertaken near-continuous monitoring of the Seyfert 1 galaxy NGC 7469 in the X-ray with *RXTE* over a ∼ 30 d baseline. The source shows strong variability with a root-mean-square (rms) amplitude of ∼ 16 per cent, and peak–to–peak variations of a factor of order 2. Simultaneous data over this period were obtained in the ultraviolet (UV) using *IUE*, making this the most intensive X-ray UV/X-ray variability campaign performed for any active galaxy.

Comparison of the continuum light curves reveals very similar amplitudes of variability, but different variability characteristics, with the X–rays showing much more rapid variations. The data are not strongly correlated at zero lag. The largest absolute value of the correlation coefficient occurs for an anticorrelation between the two bands, with the X-ray variations leading the UV by ~ 4 d. The largest positive correlation is for the ultraviolet to lead the X-rays by ~ 4 d. Neither option appears to be compatible with any simple interband transfer function. The peak positive correlation at ~ 4d occurs because the more prominent peaks in the UV light curve appear to lead those in the X-rays by this amount. However, the minima of the light curves are near-simultaneous. These observations provide new constraints on theoretical models of the central regions of active galactic nuclei. Models in which the observed UV emission is produced solely by re-radiation of absorber X-rays are ruled out by our data, as are those in which the X-rays are produced solely by Compton upscattering of the observed UV component by a constant distribution of particles. New or more complex models must be sought to explain the data. We require at least two variability mechanisms, which have no simple relationship. We briefly explore means by which these observations could be reconciled with theoretical models.

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