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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.
Rob Beswick

Abstracts of recently accepted papers

Physical Conditions in the Narrow-Line Region of Markarian 3. I. Observational Results

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We use Hubble Space Telescope/Space Telescope Imaging Spectrograph (HST/STIS) longslit low-resolution spectroscopy from 1150 Å to 10,300 Å to study the physical conditions in the narrow-line region (NLR) of the Seyfert 2 galaxy Markarian 3. We find from the HeII λ1640/λ4686 line ratio and the Balmer decrement that the extinction within Markarian 3 along the line-of-sight to the NLR is best characterized by a Large Magellanic Cloud (LMC) type extinction curve. We observe an extinction gradient increasing from west to east along the STIS slit (at position angle 71 degrees measured east from north) in both line and continuum emission. We infer from this gradient that the host galaxy disk is tilted towards the observer in the east: the line-of-sight to the eastern emission-line cone intersects more dust in the plane of the galaxy than that to the western cone. From emission-line diagnostics we find that the NLR gas is photoionized by the hidden active galactic nucleus (AGN) continuum and that its density decreases with increasing distance from the center. We model the observed continuum as a combination of reddened host galaxy light from an old stellar population, reddened H^+ and He^{+2} recombination continua, and less reddened scattered light from the central engine with spectral index α=1 ($L_\nu \propto \nu^{-\alpha}$). The host galaxy to scattered-light ratio is estimated to be 3:1 at 8125 Å in 0.1 $\times$ 1.8 square-arcsecond aperture. Using a two-component power-law model for the ionizing continuum (α=2 for 13.6 eV $<$ E $<$ 0.2 keV and α=1 for 0.2 keV $<$ E $<$ 50 keV) we find that the covering factor (normalized for our observation aperture) of the NLR gas is >0.7%. We estimate that the amount of intrinsic non-ionizing UV continuum scattered into our line-of-sight is 0.04%. This is consistent with our estimate of the scattering fraction for broad CIV $\lambda\lambda$1548,1551 emission.

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The Fundamental Plane Evolution of Active Galactic Nucleus Host Galaxies

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We measured the stellar velocity dispersions of 15 active galactic nucleus (AGN) host galaxies at redshifts as high as ~ 0.34. Combining these with published velocity dispersion measurements from the literature,we study the Fundamental Plane of AGN host galaxies and its evolution. BL Lac hosts and radio galaxies seem to lie on the same Fundamental Plane as normal early-type galaxies. The evolution of the mass-to-light ratio of AGN host galaxies shows a similar trend to that observed in normal early-type galaxies, consistent with single-burst passive evolution models with formation redshifts $z \gtrsim 1$. The lack of a significant difference between normal and AGN host galaxies in the Fundamental plane supports the "Grand Unification" picture wherein AGNs are a transient phase in the evolution of normal galaxies. The black hole masses of BL Lac objects and radio galaxies, derived using the mass – dispersion relation, are similar. The black hole mass is independent of BL Lac type. The local black hole mass – host galaxy luminosity relation of our sub-sample at $z < 0.1$ is similar to that of local normal and radio galaxies, but is less well defined at higher redshiftdue to the luminosity evolution of the host galaxies.

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preprint available at http://arxiv.org/abs/astro-ph/0409006

Continuum Acceleration of Black Hole Winds

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Motivated by recent observations of high-velocity, highly ionized winds in several QSOs, models of purely continuum-driven winds launched from $\sim 200GM_{\rm BH}/c^2$ are presented. Launching conditions are investigated, as well as the observational signatures for a variety of initial conditions and illuminating continua. While we verify that continuum-driven highly ionized outflows reach the observed velocities for $L/L_{\rm Edd} \geq 1$ independent of the incident spectral shape, such winds are too highly ionized to exhibit the observed absorption features when launched with an active galactic nucleus continuum (in fact, such winds are so ionized that they are driven primarily by electron scattering). If the wind is instead illuminated with a blackbody continuum originating from an optically thick shield, the gas is too weakly ionized and does not produce high-energy absorption features. If high-velocity high-ionization winds are truly launched from very near the black hole, such winds must be launched under other conditions or via other processes; we summarize some possibilities.

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Unveiling the nature of the highly obscured AGN in NGC 5643 with XMM-Newton

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We present results from an XMM-Newton observation of the nearby Seyfert 2 galaxy NGC 5643. The nucleus exhibits a very flat X-ray continuum above 2 keV, together with a prominent K_α fluorescent iron line. This indicates heavy obscuration. We measure an absorbing column density N_H in the range 6–10$\times10^{23}$ cm^{-2}, either directly covering the nuclear emission, or covering its Compton-reflection. In the latter case, we might be observing a rather unusual geometry for the absorber, whereby reflection from the inner far side of a torus is in turn obscured by its near side outer atmosphere. The nuclear emission might be then either covered by a Compton-thick absorber, or undergoing a transient state of low activity. A second source (christened "X-1" in this paper) at the outskirts of NGC 5643 optical surface outshines the nucleus in X-rays. If belonging to NGC 5643, it is the third brightest ($L_X \sim 4 \times 10^{40}$ erg s^{-1}) known Ultra Luminous X-ray source. Comparison with past large aperture spectra of NGC 5643 unveils dramatic X-ray spectral changes above 1 keV. We interpret them as due to variability of the active

nucleus *and* of source X-1 intrinsic X-ray powers by a factor $\geq$10 and 5, respectively.

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The Largest Blueshifts of [O III] emission line in Two Narrow-Line Quasars

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We have obtained optical intermediate resolution spectra ($R = 3000$) of the narrow-line quasars DMS 0059−0055 and PG 1543+489. The [O III] emission line in DMS 0059−0055 is blueshifted by 880 km s^{-1} relative to Hβ. We also confirm that the [O III] emission line in PG 1543+489 has a relative blueshift of 1150 km s^{-1}. These two narrow-line quasars show the largest [O III] blueshifts known to date among type 1 active galactic nuclei (AGNs). The [O III] emission lines in both objects are broad (1000 – 2000 km s^{-1}) and those in DMS 0059−0055 show strong blue asymmetry. We interpret the large blueshift and the profile of the [O III] lines as the result of an outflow interacting with circumnuclear gas. Among type 1 AGNs with large blueshifted [O III], there is no correlation between the Eddington ratios and the amount of [O III] blueshifts. Combining our new data with published results, we confirm that the Eddington ratios of the such AGNs are the highest among AGNs with the same black hole masses. These facts suggest that the Eddington ratio is a necessary condition or the [O III] blueshifts weakly depend on the Eddington ratio. Our new sample suggests that there are possible necessary conditions to produce an outflow besides a high Eddington ratio: large black hole mass ($> 10^7 M_{solar}$) or high mass accretion rate ($> 2M_{solar}$/yr) or large luminosity ($\lambda L_\lambda(5100\text{Å}) > 10^{44.6}$ erg s^{-1}).

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Neutral hydrogen at milliarcsecond resolutions: The radio galaxy 3C293

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We present new milliarcsecond resolution observations of the HI absorption against the kiloparsec scale inner jet of the radio galaxy 3C 293. Using a combination of observations obtained with global VLBI, MERLIN and the VLA we have imaged the strong and extensive neutral hydrogen absorption against the radio core and jet of this source across a wide range of angular scales.

In this proceedings we will present these new combined milliarcsecond scale VLBI results alongside our previous lower resolution MERLIN studies of the HI absorption in this source. This study will allow us to investigate the distribution and dynamics of the HI absorption in the centre of this source from scales of arcseconds to a few milliarcsecond.

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Transition (LINER/HII) nuclei as evolved Composite (Seyfert 2/Starburst) nuclei

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We compare the circumnuclear stellar population and environmental properies of Seyfert and Composite (Seyfert + Starburst) nuclei with those of LINERs and LINER/HII transition galaxies (TOs), and discuss evidence for evolution from Seyfert/Composite to LINER/TO nuclei.

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Probing the Kinematics of the Narrow-Line Region in Seyfert Galaxies with Slitless Spectroscopy: Observational Results[1]

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[1]Based on observations made with the NASA/ESA Hubble Space Telescope, obtained at the Space Telescope Science Institute, which is operated by the Association of Universities for Research in Astronomy, Inc., under NASA contract NAS 5-26555. These observations are associated with proposal GO-8340.

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We present slitless spectra of 10 Seyfert galaxies observed with the Space Telescope Imaging Spectrograph on the *Hubble Space Telescope* (*HST*). The spectra cover the [O III] $\lambda\lambda$4959, 5007 emission lines at a spectral resolving power of $\lambda/\Delta\lambda \approx 9000$ and a spatial resolution of $\sim 0''.1$. We compare the slitless spectra with previous *HST* narrow-band images to determine the velocity shifts and dispersions of the bright emission-line knots in the narrow-line regions (NLRs) of these Seyferts, which extend out to at least several hundred pc from their nuclei. Many knots are spatially resolved with sizes of tenths of arcsecs, corresponding to tens of pcs, and yet they appear to move coherently with radial velocities between zero and $\pm$ 1200 km s^{-1} with respect to the systemic velocities of their host galaxies. The knots also show a broad range in velocity dispersion, ranging from $\sim$30 km s^{-1} (the velocity resolution) to $\sim$1000 km s^{-1} FWHM. Most of the Seyfert galaxies in this sample show an organized flow pattern, with radial velocities near zero at the nucleus (defined by the optical continuum peak) and increasing to maximum blueshifts and redshifts within $\sim 1''$ of the nucleus, followed by a decline to the systemic velocity. However, there are large local variations around this pattern and in one case (NGC 7212), the radial velocities are nearly chaotic. The emission-line knots also follow a general trend of decreasing velocity dispersion with increasing distance from the nucleus. In the Seyfert 2 galaxies, the presence of blueshifts and redshifts on either side of the nucleus indicates that rotation alone cannot explain the observed radial velocities. The most straightforward interpretation is that radial outflow plays an important role in the NLR kinematics. Each of the Seyfert galaxies in this sample (with the exception of Mrk 3) shows a bright, compact (FWHM $\leq 0''.5$) [O III] knot at the position of its optical nucleus. These nuclear emission-line knots have radial-velocity centroids near zero, but they typically have the highest velocity dispersions. Their similar properties suggest they may be a common, distinct component of the NLR.

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Thesis

Linking the Power Sources of Emission-Line Galaxy Nuclei from the Highest to the Lowest Redshifts

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This dissertation searches for common grounds for the diversity of properties exhibited by the emission-line nuclei of galaxies, from large look-back times to the local universe. I present results of (1) a program of high signal-to-noise spectroscopy for 44 $z \gtrsim 4$ quasars using the MMT and Keck observatories; (2) a detailed analysis of the ultraviolet and optical spectral behavior of 22 Narrow Line Seyfert 1 (NLS1) galaxies based on archival *Hubble Space Telescope* (HST) spectra; (3) an in-depth investigation of the proposed link between NLS1s and $z \gtrsim 4$ quasars, by means of comparison of composite spectra, and a Principal Component Analysis; (4) a simulation of Seyferts/quasars designed to explore the role of dust in modifying their observed spectral energy distribution; and (5) a sensitive search for accretion signatures in a large sample of nearby emission-line galaxy nuclei, employing a quantitative comparison of the nebular line flux ratios in small (HST) and large (ground-based) apertures.

The low and high redshift quasars are found very similar in their emission characteristics, although differences exist. In particular, the data bolster indications of supersolar metallicities in the luminous, $z \gtrsim 4$ sources, which support scenarios that assume substantial star formation concurrent or preceding the quasar phenomena. Because high-z sources are more metal enriched and more spectroscopically heterogeneous than the NLS1s, a close connection between these objects remains doubtful. The results show that NLS1s have redder UV-blue continua than those measured in other quasars and Seyferts. The sources with UV line absorption are in general less powerful and show redder spectra, indicating that a luminosity-dependent dust absorption may be important in modifying their continua. A receding-torus –like geometry seems to explain these trends and other observed correlations between quasar luminosity and continuum slope. Finally, in most of the nearby emission-line nuclei, the expected increased AGN-like behavior at smaller scales is not seen, although the nuclear emission is resolved. This suggests that these sources are not necessarily powered by accretion onto a compact object, and that the composite model proposed for the LINER/H II transition nuclei (that assumes a central accreting-type nucleus surrounded by star-forming regions) is not generally supported.