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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

A simple text for the existence of two accretion modes in Active Galactic Nuclei

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By analogy to the different accretion states observed in black-hole X-ray binaries (BHXBs), it appears plausible that accretion disks in active galactic nuclei (AGN) undergo a state transition between a radiatively efficient and inefficient accretion flow. If the radiative efficiency changes at some critical accretion rate, there will be a change in the distribution of black hole masses and bolometric luminosities at the corresponding transition luminosity. To test this prediction, I consider the joint distribution of AGN black hole masses and bolometric luminosities for a sample taken from the literature. The small number of objects with low Eddington-scaled accretion rates $\dot{m} < 0.01$ and black hole masses $M_{\rm BH} < 10^9\,M_\odot$ constitutes tentative evidence for the existence of such a transition in AGN. Selection effects, in particular those associated with flux-limited samples, systematically exclude objects in particular regions of the $(M_{\rm BH}, L_{\rm bol})$ plane. Therefore, they require particular attention in the analysis of distributions of black hole mass, bolometric luminosity, and derived quantities like the accretion rate. I suggest further observational tests of the BHXB-AGN unification scheme which are based on the jet domination of the energy output of BHXBs in the *hard* state, and on the possible equivalence of BHXB in the *very high* (or *steep power-law*) state showing ejections and efficiently accreting quasars and radio galaxies with powerful radio jets.

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The Murmur of the Sleeping Black Hole: Detection of Nuclear Ultraviolet Variability in LINER Galaxies

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LINER nuclei, which are present in many nearby galactic bulges, may be the manifestation of low-rate or low-radiative-efficiency accretion onto supermassive central black holes. However, it has been unclear whether the compact ultraviolet (UV) nuclear sources present in many LINERs are clusters of massive stars, rather than being directly related to the accretion process. We have used the Hubble Space Telescope to monitor the UV variability of a sample of 17 galaxies with LINER nuclei and compact nuclear UV sources. Fifteen of the 17 galaxies were observed more than once, with two to five epochs per galaxy, spanning up to a year. We detect significant variability in most of the sample, with peak-to-peak amplitudes from a few percent to 50%. In most cases, correlated variations are seen in two independent bands (F250W and F330W). Comparison to previous UV measurements indicates, for many objects, long-term variations by factors of a few over decade timescales. Variability is detected in LINERs with and without detected compact radio cores, in LINERs that have broad Hα wings detected in their optical spectra ("LINER 1's"), and in those that do not ("LINER 2s"). This variability demonstrates the existence of a non-stellar component in the UV continuum of all types, and sets a lower limit to the luminosity of this component. Interestingly, all the LINERs that have detected radio cores have variable UV nuclei, as one would expect from *bona fide* AGNs. We note a trend in the UV color (F250W/F330W) with spectral type – LINER 1s tend to be bluer than LINER 2s. This trend may indicate a link between the shape of the nonstellar continuum and the presence or the visibility of a broad-line region. In one target, the post-starburst galaxy NGC 4736, we detect variability in a previously noted UV source that is offset by $2''.5$ ($\sim$ 60 pc in projection) from the nucleus. This may be the nearest example of a binary active nucleus, and of the process leading to black hole merging.

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The XMM-Newton view of PG quasars. I. X–ray continuum and absorption

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We present results of a systematic analysis of the XMM-Newton spectra of 40 quasars (QSOs) (z$\leq$ 1.72) from the Palomar–Green (PG) Bright Quasar Survey sample ($M_B < -23$). The sample includes 35 radio-quiet quasars (RQQs) and 5 radio-loud quasars (RLQs). The analysis of the spectra above 2 keV reveals that the hard X–ray continuum emission can be modeled with a power law component with $\langle\Gamma_{2-12\ \rm keV}\rangle = 1.89 \pm 0.11$ and $\langle\Gamma_{2-12\ \rm keV}\rangle = 1.63^{+0.02}_{-0.01}$ for the RQQs and RLQs, respectively. Below 2 keV, a strong, broad excess is present in most QSO spectra. This feature has been fitted with four different models assuming several physical scenarios. All tested models (blackbody, multicolor blackbody, bremsstrahlung and power law) satisfactorily fitted the majority of the spectra. However, none of them is able to provide an adequate parameterization for the soft excess emission in all QSOs, indicating the absence of a universal shape for this spectral feature. An additional cold absorption component was required only in three sources. On the other hand, as recently pointed out by Porquet et al. (2004) for a smaller sample of PG QSOs, warm absorber features are present in 50% of the QSO spectra in contrast with their rare occurrence ($\sim$ 5–10%) in previous studies. The XMM-Newton view of optically selected bright QSOs therefore suggests that there are no significant differences in the X–ray spectral properties compared with those of the low–luminosity Seyfert 1 galaxies. Properties of the Fe Kα emission lines are presented in a companion paper.

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The XMM–Newton view of PG quasars II. Properties of the Fe K_α line

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The properties of the fluorescence Fe K_α emission lines of a sample of 38 quasars (QSOs) observed with *XMM-Newton* are studied. These objects are included in the optically selected sample from the Palomar–Green (PG) Bright Quasar Survey with an X–ray luminosity $1.3 \times 10^{43} < L_{2-10\,keV} < 5.1 \times 10^{45}$ erg s^{-1} and z$\leq$1.72. For each object in the sample, we investigated the presence of both narrow and broad iron lines in detail. A total of 20 out of the 38 QSOs show evidence of an Fe K_α emission line with a narrow profile. The majority of the lines are consistent with an origin in low ionization material, which is likely to be located in the outer parts of the accretion disk, the molecular torus, and/or the Broad Line Region. The average properties of the narrow Fe K_α emission line observed in the sample are similar to those of Seyfert type galaxies as inferred from recent *XMM-Newton* and *Chandra* studies. A broad line has been significantly detected in only three objects. Furthermore, we studied the relationship between the equivalent width (EW) of the iron line and the hard band X–ray luminosity for radio quiet quasars. The analysis indicates that no clear correlation between the strength of the line and the hard X–ray luminosity is present, and our results do not show compelling evidence for an anticorrelation between these two quantities, i.e. the so-called *X–ray Baldwin effect*.

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Chandra High-Resolution X-ray Spectroscopy of the Fe K Line in the Seyfert 1 Galaxy NGC 3783

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We report on the results of detailed X-ray spectroscopy of the Fe-K region in the Seyfert 1 galaxy NGC 3783 using the *Chandra* High Energy Grating Transmission Spectrometer (*HETGS*). There were five observations over an interval of $\sim$ 125 days in 2001, each with an exposure time of $\sim$ 170 ks. The combined data constitute the highest signal-to-noise Fe-K spectrum having the best velocity resolution in the Fe-K band to date (FWHM $\sim$ 1860 km s^{-1}). The combined data show a resolved Fe Kα line core (FWHM = 1700^{+410}_{-390} km s^{-1}) with a center energy of 6.397 ± 0.003 keV, consistent with an origin in neutral or lowly ionized Fe, located between the BLR and NLR. We also find that excess flux around the base of the Fe Kα line core can be modeled with either a Compton scattering "shoulder" or an emission line (with about the same flux as the line core) from a relativistic accretion disk, having an inclination angle of 11° or less. This disk line model is as good as a Compton-shoulder model for the base of the Fe Kα line core. In the latter model, we measured the column density to be $7.5^{+2.7}_{-0.6} \times\ 10^{23}$ cm^{-2}, which corresponds to a Thomson optical depth of ~ 0.60, so the line-emitting matter is not quite Compton-thick. An intrinsic width of 1500^{+460}_{-340} km s^{-1} FWHM is still required in this model. Moreover, more complicated scenarios involving both a Compton-shoulder and a disk line cannot be ruled out. We also detect an absorption feature due to He-like Fe (FWHM = 6405^{+5020}_{-2670} km s^{-1}), first reported by Reeves *et al.* (2004) from *XMM-Newton* data.

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Evidence for a Starburst within 9 pc of the Active Nucleus of NGC 1097

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We report evidence for a recent burst of star formation located within 9 pc of the active nucleus of NGC 1097. The observational

signatures of the starburst include UV absorption lines and continuum emission from young stars observed in a small-aperture *HST* spectrum. The burst is $\leq$ a few $\times$ 10^6 yr old, has a mass of $\sim 10^6$ $M_\odot$, an observed luminosity of 1.5 $\times$ 10^7 $L_\odot$ and is obscured by $A_V \approx 3$ mag. The importance of this finding is two-fold: (1) the proximity of the starburst to the active nucleus and thus possible association with it; (2) its obscuration by and apparent association with a dusty absorbing medium, while continuum and the broad emission lines appear unobscured, suggesting that the starburst could be embedded in a circumnuclear torus as predicted in the Unified Model of active galactic nuclei.

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Galactic Wind Shells and High Redshift Radio Galaxies On the Nature of Associated Absorbers

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A jet is simulated on the background of a galactic wind headed by a radiative bow shock. The wind shell, which is due to the radiative bow shock, is effectively destroyed by the impact of the jet cocoon, thanks to Rayleigh-Taylor instabilities. Associated strong HI absorption, and possibly also molecular emission, in high redshift radio galaxies which is observed preferentially in the smaller ones may be explained by that model, which is an improvement of an earlier radiative bow shock model. The model requires temperatures of $\approx 10^6$ K in the proto-clusters hosting these objects, and may be tested by high resolution spectroscopy of the Lyα line. The simulations show that – before destruction – the jet cocoon fills the wind shell entirely for a considerable time with intact absorption system. Therefore, radio imaging of sources smaller than the critical size should reveal the round central bubbles, if the model is correct.

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