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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

XMM-Newton observation of the BAL Quasar PHL 5200: The big surprise

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XMM-Newton observations of the BAL quasar PHL 5200 revealed that the X-ray emission attributed to the quasar originates from a nearby, optically unidentified radio source. Although visible in X-rays as well the flux from PHL 5200 is by a factor $\gtrsim 20$ smaller than previously anticipated. Thus most of the scenarios for a physical interpretation of the BAL phenomenon, based on the apparently unexpected X-ray properties of this quasar have to be revisited. We further discuss the properties of the optically very faint radio source.

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Geometry and Kinematics in the Central Broad-Line Region of a Seyfert 1 Galaxy

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We recorded spectra of the highly variable Seyfert 1 galaxy Mrk 110 in a variability campaign with the 9.2m Hobby-Eberly Telescope at McDonald Observatory in order to study the detailed line profile variations of the broad emission lines. Here we show that only an AGN model predicting the formation of the broad Hβ line emission in the wind of an accretion disk matches the observed 2-D variability pattern. Furthermore, we derive an improved mass of the central supermassive black hole of $M = 1.0^{+1.0}_{-0.5} \times 10^7 M_\odot$ from the Hβ velocity-delay map.

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Near Infrared Observations of Soft X-ray Selected AGN

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We report the results of near infrared observations of 19 soft X-ray selected AGN. The goal of the observations was to search for strong, narrow Paα or Brγ emission lines, as a sign of nuclear starbursts. We found Paα emission in the spectra of 11 sources and Brγ in at least five. Strong NIR emission has been found in two sources, CBS 126 and Mkn 766, both objects with strong [OIII]λ5007 emission, weak Fe II emission and wavelength dependent degree of polarization in the optical. Classical Narrow Line Seyfert 1 galaxies do not show exceptionally strong NIR emission lines. We present the results of our study and discuss how our findings fit into an evolutionary scheme of AGN.

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preprint available at http://www.xray.mpe.mpg.de/~dgrupe/research/refereed.html

Exploratory Chandra Observations of the Three Highest Redshift Quasars Known

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We report on exploratory *Chandra* observations of the three highest redshift quasars known ($z = 5.82$, 5.99, and 6.28), all found in the Sloan Digital Sky Survey. These data, combined with a previous *XMM-Newton* observation of a $z = 5.74$ quasar, form a complete set of color-selected, $z > 5.7$ quasars. X-ray emission is detected from all of the quasars at levels that indicate that the X-ray to optical flux ratios of $z \approx 6$ optically selected quasars are similar to those of lower redshift quasars. The observations demonstrate that it will be feasible to obtain quality X-ray spectra of $z \approx 6$ quasars with current and future X-ray missions.

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preprint and supporting materials available at http://www.astro.psu.edu/users/niel/papers/papers.html

UBVRI Simultaneous Observations of the Nucleus of Seyfert Galaxy NGC 5548 in 1993–1999

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An ongoing program on photometric and spectral monitoring of some bright Seyfert galaxies has been carried out at the Crimean Astrophysical Observatory since 1989. Results of photometric observations of NGC 5548 obtained with the 1.25m telescope are reported in this paper; it focuses on the analysis of intranight variations. During 44 observational nights in 1993–1999 in each spectral band of the Johnson *UBVRI* system, 672 measurements have been performed simultaneously through the round aperture (diameter 15 arcsec) using differential photometry techniques. The estimated accuracy of each measurement is about 0.01 mag. The peak amplitude $\mathrm{R}_{\max} = F_{\max}/F_{\min} = 2.99$ for the whole light curve was observed in the U band, while the minimum amplitude $F_{\max}/F_{\min}$=1.37 occurred in the I band during the full observation period. *UBVRI* observations and good sampled data of international monitoring campaigns of NGC 5548, were used to calculate Structure Functions. A comparison is made of the characteristics of the long and short time scale variations of NGC 5548 with those of NGC 4151, NGC 7469 and NGC 1275. In order to examine the intranight variations of the nucleus of NGC 5548, standard deviations (SD) of the nightly averaged flux F, and a measure of intranight variability – SD/F were calculated for each night. Using this parameter, a probability characteristics is introduced, and duty cycles (the fraction of time when the galaxy is variable), characterizing the efficiency of the central energy source, were evaluated. It is concluded that intranight variability is really transient in character and manifests itself with different probabilities for different galaxies.

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The Ionized Gas and Nuclear Environment in NGC 3783. I. Time-Averaged 900 ks *Chandra* Grating Spectroscopy

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We present results from a 900 ks exposure of NGC 3783 with the High-Energy Transmission Grating Spectrometer on board the *Chandra X-ray Observatory*. The resulting X-ray spectrum, which covers the 0.5–10 keV energy range, has the best combination of signal-to-noise and resolution ever obtained for an AGN. This spectrum reveals absorption lines from H-like and He-like ions of N, O, Ne, Mg, Al, Si, and S. There are also possible absorption lines from H-like and He-like Ar and Ca as well as H-like C. We also identify inner-shell absorption from lower-ionization ions such as Si VII–Si XII and S XII–S XIV. The iron absorption spectrum is very rich; L-shell lines of Fe XVII–Fe XXIV are detected, as well as probable resonance lines from Fe XXV. A strong complex of M-shell lines from iron ions is also detected in the spectrum The absorption lines are blueshifted relative to the systemic velocity by a mean velocity of -590 ± 150 km s^{-1}. We resolve many of the absorption lines, and their mean FWHM is 820 ± 280 km s^{-1}. We do not find correlations between the velocity shifts or the FWHMs with the ionization potentials of the ions. Most absorption lines show asymmetry, having more extended blue wings than red wings. In O VII we have resolved this asymmetry to be from an additional absorption system at ~ -1300 km s^{-1}. The two X-ray absorption systems are consistent in velocity shift and FWHM with the ones identified in the UV lines of C IV, N V, and H I. Equivalent width measurements for all absorption and emission lines are given and column densities are calculated for several ions. We resolve the narrow Fe Kα line at 6398.2 ± 3.3 eV to have a FWHM of 1720 ± 360 km s^{-1}, which suggests that this narrow line may be emitted from the outer part of the broad line region or the inner part of the torus. We also detect a "Compton shoulder" redward of the narrow Fe Kα line which indicates that it arises in cold, Compton-thick gas.

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Absorbers and Globular Cluster Formation in Powerful High Redshift Radio Galaxies

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A radiative hydrodynamic simulation for a typical, powerful high redshift radio galaxy is presented. The jet is injected at one third the speed of light into a 10000 times denser, homogeneous medium. In the beginning of the simulation, the bow shock consists of a spherical shell that is similar to a spherical blast wave. This shell cools radiatively down to $\approx 10^4$ K, providing after 6×10^6 yrs a neutral column of $3.8 \times 10^{21}\,\mathrm{cm}^{-2}$ around the whole system. The shell starts to fragment and forms condensations. This absorbing screen will cover a smaller and smaller fraction of the radio source, and therefore the emission line region, and eventually form stars in typically 10^4 globular clusters of $10^6 \mathrm{M}_\odot$. Approximately $10^9 \mathrm{M}_\odot$ are entrained into the radio cocoon. This gas, cooling and illuminated from the radio source, could be the emission line gas observed in high redshifted radio galaxies and radio loud quasars. The neutral column behind the bow shock can account for the absorption found in almost all of the small sources. The globular cluster excess of $\approx 10^4$ systems found in present day brightest cluster galaxies (BCGs), which are believed to be the vestiges of these objects, is consistent with the presented scenario.

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ULIRGs: Origin and Evolution

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We present our preliminary results on the study of the high luminosity ULIRGs (log(LFIR) ¿ 12.3) in the 1Jy sample. Deep, high resolution optical R images with 7 arcmin x 7 arcmin field of view for 2/3 of the whole sample, show that they are generally found in very rich environments, they seem to be late stage merger products (long tidal tails are found in only 3 systems) and all of them show multiple nuclei (double nuclei in 11: 2HII, 4 LINERs, 4 Sy2 and 1 Sy1). GTC first light instruments are very well suited for addressing the question of the energy source of ULIRGs, together with a more refined view of the proposed evolutionary sequence.

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Adaptive Optics Imaging of Quasar Hosts

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We present the results of adaptive-optics imaging of 12 (z ¡ 0.6) quasars in the H and K bands using the PUEO system mounted on the Canada-France-Hawaii telescope. The QSOs ($m_V > 15.0$) themselves are used as reference for the correction. The images, obtained under poor seeing conditions, have typical spatial resolution of FWHM 0.3arcsec before deconvolution. The deconvolved H-band image of PG 1700+514 has a spatial resolution of 0.16arcsec and reveals a wealth of details on the companion and the host-galaxy. The comparison between the HST and CFHT images of PG 1700+514 shows how powerful and competitive ground-based AO can be. Close companions and obvious signs of interactions are found in 4 out of the 12 objects. The 2D images of 3 of the host-galaxies unambiguously reveal bars and spiral arms. The morphology of the other host-galaxies are difficult to determine from 1D surface brightness profiles and deeper images are needed that could be obtained with AO systems on 10m class telescopes. Analysis of mocked data shows that elliptical galaxies are always recognized as such, whereas disk hosts can be missed for small disk scale lengths and large QSO contributions.

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Chandra Detection of Highest Redshift (z∼6) Quasars in X-rays

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We report on *Chandra* observations of three quasars SDSSP J083643+005453 , SDSSP J103027+052455 and SDSSP J130608+035626 at redshifts 5.82, 6.28 and 5.99 respectively. All three sources are clearly detected in the X-ray band, up to rest frame energies of ∼ 55 keV. These observations demonstrate the unprecedented sensitivity of *Chandra* to detect faint sources in relatively short exposure times (5.7–8.2 ksec). The broad band X-ray properties of these highest redshift quasars do not appear to be any different from their lower redshift cousins, implying little/no evolution for these few sources out to z∼6, at redshifts where the optical space density is falling. Spectra of the sources could not be determined with only few counts detected. Observations with XMM-Newton will be able to constrain the spectral shapes, if they are simple. Determination of complex spectra in a reasonable amount of time, however, will have to await next generation of X-ray missions.

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Are quasars accreting at super-Eddington rates?

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In a previous paper, Collin & Huré (2001), using a sample of Active Galactic Nuclei (AGN) where the mass has been determined by reverberation studies (the Kaspi et al. 2000 sample), have shown that if the optical luminosity is emitted by a steady accretion disc, it implies that about half of the objects of the sample are accreting close to the Eddington rate or at super-Eddington rates. We discuss here this problem in more details, evaluating different uncertainties, and we conclude that this result is unavoidable, unless the masses are strongly underestimated by reverberation studies. This can occur if the broad line region is a flat thin rotating structure with the same axis as the accretion disc, close to the line of sight. However the masses deduced from reverberation mapping in AGN follow the same correlation between the black hole mass and the bulge mass as normal galaxies (Laor 2001), suggesting that they are correct within factor of a few. There are then three issues to the problem:

1. accretion proceeds at Eddington or super-Eddington rates in these objects through slim or thick discs;

2. the optical luminosity is not produced directly by the gravitational release of energy, but by another additional mechanism, so super-Eddington rates are not required;

3. accretion discs are completely "non standard". Presently neither the predictions of models nor the observed spectral distributions are sufficient to help choosing between these solutions. In particular, even for the super-Eddington model, the observed optical to bolometric luminosity ratio would be of the order of the observed one.

In the super-Eddington solution, there is a strong anti-correlation between the observed velocity widths of the lines and the computed Eddington ratios (i.e. the accretion rate to the Eddington rate ratios), the largest ratios corresponding to the narrowest lines, actually to "Narrow Line Seyfert 1" nuclei. For the considered sample, the Eddington ratio decreases with an increasing black hole mass, while the opposite is found if the accretion rate is assumed to be proportional to the optical-UV luminosity, as it is usually done. If these results are extrapolated to all quasars, it implies that the amount of mass locked in massive black holes should be larger than presently thought.

If the Eddington ratio is assumed to be smaller than unity, the optical luminosity has to be produced by an additional non gravitational mechanism. It has to be emitted by a dense and thick medium located at large distances from the center (10^3 to 10^4 gravitational radii). It can be due to reprocessing of the X-ray photons from the central source in a geometrically thin warped disc, or in dense "blobs" forming a geometrically thick system, which can be a part of the accretion flow or can constitute the basis of an outflow.

The third possibility is not explored here, as it requires completely new models of accretion discs which are still not elaborated.

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