Active Galaxies Newsletter	*An electronic publication dedicated to the observation and theory of active galaxies*
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Abstracts - Thesis Abstracts - Jobs - Meetings

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.

As editor of this Newsletter I would like to take this opportunity to wish a very happy new year to all of the subscribers and thank you all for the continued support and suggestions for the newsletter.

Rob Beswick

Abstracts of recently accepted papers

The Effect of Changes in the ASCA Calibration on the Fe-K Lines in Active Galaxies

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The *ASCA* calibration has evolved considerably since launch and indeed, is still evolving. There have been concerns in the literature that changes in the *ASCA* calibration have resulted in the Fe-K lines in active galaxies (AGN) now being *systematically* narrower than was originally thought. If this were true, a large body of *ASCA* results would be impacted. In particular, it has been claimed that the broad red wing (when present) of the Fe-K line has been considerably weakened by changes in the *ASCA* calibration. We demonstrate explicitly that changes in the *ASCA* calibration over a period of about eight years have a negligible effect on the width, strength, or shape of the Fe-K lines. The reduction in both width and equivalent width is only $\sim 8\%$ or less. We confirm this with simulations and individual sources, as well as sam ple average profiles. The average profile for type 1 AGN is still very broad, with the red wing extending down to ~ 4 keV. The reason for the claimed, apparently large, discrepancies is that in some sources the Fe-K line is complex, and a single-Gaussian model, being an inadequate description of the line profile, picks up different portions of the profile with different calibration. Single-Gaussian fits do not therefore model all of the line emission in some sources, in which case they do not compare old and current calibration since the models do not then describe the data.

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preprint available at http://arXiv.org/abs/astro-ph/0112318

The X-ray properties of 2MASS Red Active Galactic Nuclei

Belinda J. Wilkes[1], **Gary D. Schmidt**[2], **Roc M. Cutri**[3], **Himel Ghosh**[1], **Dean C. Hines**[2], **Brant Nelson**[3] and **Paul Smith**[2]

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The Two Micron All Sky Survey (2MASS) is finding previously unidentified, luminous red active galactic nuclei (AGN). This new sample has a space density similar to, or greater than, previously known AGN, suggesting that a large fraction of the overall population has been missed. *Chandra* observations of a well-defined subset of these objects reveal that all are X-ray faint, with the reddest sources being the faintest in X-rays. The X-ray hardness ratios cover a wide range, generally indicating $N_H \sim 10^{21-23}$ cm^{-2}, but the softest sources show no spectral evidence for intrinsic absorption. These characteristics suggest that a mix of absorbed, direct emission and unabsorbed, scattered and/or extended emission contributes to the X-ray flux, although we cannot rule out the possibility that they are intrinsically X-ray weak. ratio nor the optical-IR color correlates with broad-line objects AGN at low redshift. This could provide the missing population of X-ray absorbed AGN required by current models of the cosmic X-ray background. The existence of AGN which display both broad emission lines and absorbed X-rays has important implications for unification schemes and emphasizes the need for care in assigning classifications to individual AGN.

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Chandra X-ray Imaging and Spectroscopy of the M87 Jet and Nucleus

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We report X-ray imaging - spectroscopy of the jet of M87 at sub arc second resolution with the Chandra X-ray Observatory. The galaxy nucleus and all the knots seen at radio and optical wavelengths, as far from the nucleus as knot C, are detected in the X-ray observations. There is a strong trend for the ratio of X-ray to radio, or optical, flux to decline with increasing distance from the nucleus. At least three knots are displaced from their radio/optical counterparts, being tens of pc closer to the nucleus at X-ray than at radio or optical wavelengths. The X-ray spectra of the nucleus and knots are well described by power laws absorbed by cold gas, with only the unresolved nucleus exhibiting intrinsic absorption. In view of the similar spectra of the nucleus and jet knots, and the high X-ray flux of the knots closest to the nucleus, we suggest that the X-ray emission coincident with the nucleus may actually originate from the pc – or sub-pc – scale jet rather than the accretion disk.

Arguments are given that the X-ray emission process is unlikely to be inverse Compton scattering. Instead, we favor synchrotron radiation. Plotted as νS_ν, the spectra of the knots generally peak in or just above the optical - near infrared band. However, the overall spectra of at least three knots cannot be described by simple models in which the spectral index monotonically increases with frequency, as would result from synchrotron losses or a high energy cut-off to the injected electron spectrum. Instead, these spectra must turn down just above the optical band and then flatten in the X-ray band. In the context of a synchrotron model, this result suggests that either the X-ray emitting electrons/positrons in these knots represent a separate "population" from those that emit the radio and optical radiation or the magnetic field is highly inhomogeneous. If the former interpretation is correct, our results provide further support for the notion that radio galaxies produce a hard ($\gamma \simeq 2 - 2.5$, $N(E) \propto E^{-\gamma}$) spectrum of high energy ($(E/m_e c^2) \sim 10^{7-8}$) electrons and possibly positrons.

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preprint available at astro-ph/0112097

The Density and Location of the X-ray Absorbing Gas in NGC 3516

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A new *Chandra* observation and archival observations by ASCA are used to investigate spectral variations in the Seyfert 1 galaxy NGC 3516 over a period of 7 years. A large change in flux (factor ~ 50 at 1 keV) is observed between an ASCA observation in 1994 and the *Chandra* observation in 2000, with the source close to the all-time maximum and minimum X-ray flux states, respectively. We find the variations in the observed flux and spectra at these epochs to be consistent with a constant column density of line-of-sight material reacting to changes in the ionizing continuum. The data from the two epochs are consistent with a simple decrease (by a factor 8–10) in the luminosity of a constant 0.5–50 keV slope source and a line-of-sight absorber with an equivalent hydrogen column density of $10^{21.9}$ cm^{-2}. Intermediate luminosities, sampled during other ASCA observations, are all fitted by the same model with a very small change in spectral index (well below $\Delta\Gamma = 0.2$). In addition, analysis of the long (360 ks) ASCA observation in 1998 shows clear "color" variations that are entirely consistent with this model and are interpreted as due to changes in the opacity of the absorbing gas. The data allow us to put a conservative upper limit of 60 ks on the recombination time which translates to a lower limit of about 2.4×10^6 cm^{-3} on the density of the recombining gas and an upper limit of about $6 \times 10^{17} h_{75}^{-2}$ cm on its distance from the central source. These are the best limits obtained so far on the density and location of the X-ray absorbing gas in a type-1 Active Galactic Nucleus (AGN). They indicate that the absorbing gas is different, in terms of its density and location, from the ionized gas commonly observed in type-II AGN. The *Chandra* ACIS/LETGS data also reveals a strong (EW=290 eV), unresolved 6.4 keV iron line, a strong OVII 561 eV line and a marginally detected NVI 419 eV line. The former is interpreted as originating in a large column of gas of lower state of ionization seen in "reflection", and is consistent with the spectrum at high energies at all epochs. The two others emission lines are probably emitted by the gas also responsible for the line-of-sight absorption.

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Associated absorption in radio quasars. I. C IV absorption and the growth of radio sources

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We assess the global properties of associated C IV$\lambda\lambda$1548,1550 absorption lines measured in the spectra of radio-loud quasars drawn from a near-complete, low-frequency selected sample. The observations span restframe C IV in two redshift ranges — $0.7 < z < 1.0$ and $1.5 < z < 3.0$ — which were targetted in the UV with HST/STIS and in the optical with ground-based telescopes, respectively. First, we corroborate trends for C IV associated absorption to be found preferentially in steep-spectrum and lobe-dominated quasars, implying the absorbing material tends to lie away from the radio-jet axis. Furthermore, we find a clear anticorrelation between C IV absorption strength and the projected linear size of steep-spectrum quasars, indicative of an evolutionary sequence. We also find that heavily-absorbed quasars are systematically redder, implying dust is mixed in with the C IV-absorbing gas. No redshift dependence was found in any of the trends considered. These new results show that radio sources are triggered in galaxies which are exceptionally rich in gas and dust, which then dissipates on a timescale comparable with, but less than, that of the radio source. This observational sequence, together with the lack of redshift-dependence, points to a direct causal link between the event which triggered the radio source and the build-up of absorbing gas and dust, whose make-up is tantalisingly similar to the products of a post-merger starburst. Thus, these new results provide direct evidence for the clearing of absorbing material around quasars with time, as well as the probable association of starburst activity with the onset of the radio activity in AGN.

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E-mail contact: jcb@astro.ox.ac.uk, preprint available at astro-ph/0112141

On the black hole – bulge mass relation in active and inactive galaxies

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New black-hole mass estimates are presented for a sample of 72 AGN covering three decades in optical luminosity. Using a sub-sample of Seyfert galaxies, which have black-hole mass estimates from both reverberation mapping and stellar velocity dispersions, we investigate the geometry of the AGN broad-line region (BLR). It is demonstrated that a model in which the orbits of the line-emitting material have a flattened geometry is favoured over randomly orientated orbits. Using this model we investigate the $M_{bh}- L_{bulge}$ relation for a combined 90-object sample, consisting of the AGN plus a sample of 18 nearby inactive elliptical galaxies with dynamical black-hole mass measurements. It is found that, for all reasonable mass-to-light ratios, the $M_{bh} - L_{bulge}$ relation is equivalent to a linear scaling between bulge and black-hole mass. The best-fitting normalization of the $M_{bh} - M_{bulge}$ relation is found to be $M_{bh} = 0.0012 M_{bulge}$, in agreement with recent black-hole mass studies based on stellar velocity dispersions. Furthermore, the scatter around the $M_{bh} - L_{bulge}$ relation for the full sample is found to be significantly smaller than has been previously reported ($\Delta \log M_{bh} = 0.39$ dex). Finally, using the nearby inactive elliptical galaxy sample alone, it is shown that the scatter in the $M_{bh} - L_{bulge}$ relation is only 0.33 dex, comparable to that of the $M_{bh} - \sigma$ relation. These results indicate that reliable black-hole mass estimates can be obtained for high redshift galaxies.

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X-raying the Ultraluminous Infrared Starburst Galaxy and Broad Absorption Line QSO, Markarian 231, with Chandra

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With 40 ks of *Chandra* ACIS-S3 exposure, new information on both the starburst and QSO components of the X-ray emission of Markarian 231, an ultraluminous infrared galaxy and broad absorption line QSO, has been obtained. The bulk of the X-ray luminosity is emitted from an unresolved nuclear point source, and the spectrum is remarkably hard with the majority of the flux emitted above 2 keV. Most notably, significant nuclear variability (a decrease of $\sim 45\%$ in approximately 6 hours) at energies above 2 keV indicates that *Chandra* has probed within light hours of the central black hole. Though we concur with Maloney & Reynolds that the direct continuum is not observed, this variability coupled with the 188 eV upper limit on the equivalent width of the Fe Kα emission line argue against the reflection-dominated model put forth by these authors based on their *ASCA* data. Instead, we favor a model in which a small, Compton-thick absorber blocks the direct X-rays, and only indirect, scattered X-rays from multiple lines of sight can reach the observer. Extended soft, thermal emission encompasses the optical extent of the galaxy and exhibits resolved structure. An off-nuclear X-ray source with a 0.35–8.0 keV luminosity of $L_{\rm X} \approx 7 \times 10^{39}$ erg s^{-1}, consistent with the ultraluminous X-ray sources in other nearby starbursts, is detected. We also present an unpublished FOS spectrum from the *HST* archive showing the broad C IV absorption.

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preprint available at http://arXiv.org/abs/astro-ph/0112257

Meetings

CARNEGIE OBSERVATORIES ASTROPHYSICS SYMPOSIUM I "COEVOLUTION OF BLACK HOLES AND GALAXIES"

Carnegie Observatories, Pasadena, USA
20-25 October 2002

Dear Colleague,

An international conference is being planned on the topic of supermassive black holes (BHs) and their relation to galaxy formation and evolution. Efforts to search for supermassive BHs in the centers of galaxies have made rapid progress in the last few years. Candidate BHs have been identified in increasingly large numbers of galaxies, both inactive and active, to the point where statistical studies are now possible. Recent work has highlighted the close connection between the formation, growth, and evolution of supermassive BHs and their host galaxies. The purpose of this conference is to explore this exciting theme by assembling a group of researchers with diverse, but interrelated, observational and theoretical expertise. The scientific program will be framed by a series of in-depth invited reviews, to be supplemented by contributed talks, posters, and discussion sessions.

The meeting will be hosted by Carnegie Observatories in Pasadena, California, on 20-25 October 2002, as the first of a set of four scientific symposia to be held on the occasion of the Centennial of the Carnegie Institution of Washington. More information on the Centennial Symposia can be found at **http://www.ociw.edu/ociw/symposia/**.

The topics to be covered are:

-Observational Evidence for Black Holes

-Formation Processes

-Growth and Fueling

-Central Structure of Galaxies

-Black Hole Demographics and Host Galaxies

-Connections to Galaxy Formation

-Implications for the Background Radiation

We hope you find the meeting exciting. Please feel free to disseminate this information to your colleagues.

Luis C. Ho
Carnegie Observatories

Jobs

Postdoctoral Position Available

Department of Physics and Astronomy
Georgia State University, USA

Applications are invited for a postdoctoral research position in the Department of Physics and Astronomy at Georgia State University. The successful applicant will work with Prof. Michael Crenshaw and collaborators on observational and computational studies of active galaxies and quasars. Current projects include studies of mass loss in active galaxies with HST, FUSE, Chandra, and XMM; physical conditions, kinematics, and reddening in the circumnuclear regions; and variability of the continuum, emission lines, and absorption lines. Observational experience (in any wave band) and/or computational experience in the above areas are desirable.

The position is for two years beginning in summer or fall 2002, with a possible extension to three years. Curriculum vitae, a bibliography, a one-page summary of research interests, and three letters of reference should be sent to Prof. Crenshaw at the address below. The deadline for receipt of these materials is **31 January 2002**. AAE/EEO.

Please send application materials to:
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If you move or your e-mail address changes, please send the editor your new address. If the Newsletter repeatedly bounces back from an address then that address is deleted from the mailing list.