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

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 always as editor of the newsletter I am very interested to hear any suggestions or feedback regarding the newsletter. So do not hesitate in emailing me your suggestions.

Many thanks for your continued subscription.

Rob Beswick

Abstracts of recently accepted papers

Structure and Kinematics of the Broad-Line Region and Torus of Active Galactic Nuclei

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Energetics considerations imply that the broad-line region (BLR)has a high covering factor. The absence of absorption from the BLRmeans that the BLR has to have a flattened distribution and be seenthrough a polar hole. The BLR is the inward extension of the torusand they have similar geometries and covering factors. Reconcilingvelocity-resolved reverberation mapping, spectropolarimetry, and theincreasing blueshifting of BLR lines with decreasing distance fromthe centre, implies that the BLR has a significant inflow component.This inflow provides the mass inflow rate needed to power the AGN.We suggest that the mechanism producing the outward transport ofangular momentum necessary for the net inflow of the BLR is themagneto-rotational instability, and that the BLR and outer accretiondisc are one and the same.

Talk given at “The Central Kiloparsec: Active Galactic Nuclei and Their Hosts”, Ierapetra, Crete, 4-6 June, 2008. To appear inVolume 79 of the Memorie della Societa Astronomica Italiana.

E-mail contact: gaskell@astro.as.utexas.edu,
preprintavailable at http://arxiv.org/abs/0807.2889

An inhomogeneous jet model for the rapid variability of TeV blazars

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We present a new time-dependent inhomogeneous jet model of non-thermal blazar emission, which reproduces the entire spectral energy distribution together with the rapid gamma-ray variability. Ultra-relativistic leptons are injected at the base of a jet and propagate along the jet structure. We assume continuous reacceleration and cooling, producing a relativistic quasi-maxwellian (or "pile-up") particle energy distribution. The synchrotron and Synchrotron-Self Compton jet emissivity are computed at each altitude. Klein-Nishina effects as well as intrinsic gamma-gamma absorption are included in the computation. Due to the pair production optical depth, considerable particle density enhancement can occur, particularly during flaring states.Time-dependent jet emission can be computed by varying the particle injection, but due to the sensitivity of pair production process, only small variations of the injected density are required during the flares. The stratification of the jet emission, together with a pile-up distribution, allows significantly lower bulk Lorentz factors, compared to one-zone models. Applying this model to the case of PKS 2155–304 and its big TeV flare observed in 2006, we can reproduce *simultaneously* the average broad band spectrum of this source as well as the TeV spectra and TeV light curve of the flare with bulk Lorentz factor lower than 15.

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preprint available at http://arxiv.org/abs/0807.4998

First detection of hard X-ray photons in the soft X-ray transient Narrow-Line Seyfert 1 galaxy WPVS 007: The X-ray photon distribution observed by Swift

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We report on the first detection of hard X-ray photons (E >2.5 keV) in the X-ray transient Narrow-Line Seyfert 1 galaxy WPVS 007 which was the AGN with the softest X-ray spectrum during the ROSAT All-Sky Survey. The AGN is clearly detected at a level of about 2×10^{-17} W m^{-2} in the observed 0.3-10.0 keV band by *Swift* in a 50 ks observation in 2007 September. For the first time since the ROSAT All-Sky Survey observation in 1990 it was possible to derive an X-ray photon distribution by adding together all *Swift* observations that have been performed so far (85.5 ks in total). This photon distribution is consistent with an X-ray spectrum of an AGN with a partial covering absorber with a column density in the order of $\sim 1 \times 10^{23}$ cm^{-2} and a covering fraction of about 90%. A comparison with the 2002 *Chandra* data suggests that WPVS 007 has become brighter by a factor of about 4. The *Swift* data also suggest that the absorber which is causing the current low-state may have started to disappear. This disappearance is indicated by a significant change in the hardness ratio from a very soft X-ray state during the 2005 October to 2007 January observations to a rather hard X-ray state in the 2007 September observations. In the UV, WPVS 007 seems to become fainter by up to 0.5 mag over the last two years. The optical to X-ray spectral slope derived from the spectral energy distribution is $\alpha_{\rm ox}$=2.5 which classifies WPVS 007 as an X-ray weak AGN. After correcting for reddening and X-ray absorption, α_{rmox} becomes 1.9 and the luminosity in the Big-Blue-Bump is log $L_{\rm BBB}$=37.7 [W], which translates into an Eddington ratio $L/L_{\rm Edd} \approx 1$.

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preprint available at http://arxiv.org/abs/0809.2599

Radio Properties of Low Redshift Broad Line Active Galactic Nuclei

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The question as to whether the distribution of radio loudness in active galactic nuclei (AGN) is actually bimodal has been discussed extensively in the literature. Furthermore, there have been claims that radio loudness depends on black hole mass (M_{BH}) and Eddington ratio (L_{bol}/L_{Edd}). We investigate these claims using the low redshift broad line AGN sample of Greene & Ho 2007, which consists of 8434 objects at $z < 0.35$ from the Sloan Digital Sky Survey Fourth Data Release (SDSS DR4). We obtained radio fluxes from the Very Large Array Faint Images of the Radio Sky at Twenty-Centimeters (FIRST) survey for the SDSS AGN. Out of the 8434 SDSS AGN, 821 have corresponding observed radio fluxes in the FIRST survey. We calculated the radio-loudness parameter ($\mathcal{R}$) for all objects above the FIRST detection limit (1 mJy), and an upper limit to $\mathcal{R}$ for the undetected objects. Using these data, the question of radio bimodality is investigated for different subsets of the total sample. We find no clear demarcation between the radio loud (RL, $\mathcal{R} > 10$) and radio quiet (RQ, $\mathcal{R} < 10$) objects, but instead fill in a more radio-intermediate population in a continuous fashion for all subsamples. We find that 4.7% of the AGN in the flux-limited subsample are RL based on core radio emission alone. We calculate the radio-loud fraction (RLF) as both a function of M_{BH} and L_{bol}/L_{Edd}. The RLF decreases (from 13% to 2%) as L_{bol}/L_{Edd} increases over 2.5 orders of magnitude. The RLF is nearly constant (∼5%) over 4 decades in M_{BH}, except for an increase at $M_{BH} > 10^8 M_{\odot}$. We find for the FIRST detected subsample that 367 of the RL AGN have $M_{BH} < 10^8 M_{\odot}$, a large enough number to indicate that RL AGN are not a product of only the most massive black holes in the local universe.

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preprint available at http://arxiv.org/abs/0809.3977

Suzaku Observations of the Circinus galaxy

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We report *Suzaku* observations of the active, Compton-thick Circinus galaxy. Observations were obtained with both the X-ray Imaging spectrometer (XIS) and the Hard X-ray Detector (HXD). Below 10 keV, the nuclear spectrum is dominated by radiation reflected from cold dense gas of high column density, while above 13 keV the radiation is directly transmitted nuclear emission seen through a column density of $\simeq 4 \times 10^{24}\,\mathrm{cm}^{-2}$. In the 0.2–10 keV band, the XIS spectrum is contaminated at 5% level by the brightest off-nuclear source in Circinus (CG X-1), but drops to 1% in the 5-10 keV and is negligible at higher energies. We find no significant evidence for variability in the hard (> 12 keV) emission. The Circinus is marginally detected with the HXD/GSO in the 50–100 keV band at 2.5σ level. We model the 3-70 keV band XIS+PIN spectra with a four components: the Compton transmitted nuclear emission, the reflected nuclear emission, a soft power law (representing a combination of scattered nuclear emission, extended emission and contamination by sources in the galaxy below a few keV). The hard nuclear power-law is found to have a photon index $\Gamma_h \simeq 1.6$, very similar to the soft power-law. The high energy cut-off is $E_C \simeq 49$ keV. These results agree with those from BeppoSax. An extrapolation of this model up to the GSO band shows good agreement with the GSO spectrum and supports our detection of the Circinus up to $\simeq 100$ keV.

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preprint available at http://www.astro.umd.edu/ yyang/Circinus/ms.ps

Results of the First Simultaneous X-ray, Optical, and Radio Campaign on the Blazar PKS 1622–297

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Coordinated X-ray, optical, and radio observations of the blazar PKS 1622–297 were obtained during a three-week campaign in 2006 using the Rossi X-ray Timing Explorer (RXTE), the University of Michigan Radio Astronomy Observatory, and optical telescopes at Cerro Tololo Inter-American Observatory. The RXTE observations indicate that this object is a comparatively weak X-ray emitter for a Flat-Spectrum Radio Quasar. The observed broadband spectral shape indicates that X-rays were

most likely produced by the inverse Compton process. Optical observations of this object produced unexpected results in that this object appeared redder when in a bright state and bluer when in a faint state, contrary to the observed behavior of BL Lac objects.

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Dynamical Constraints on The Masses of the Nuclear Star Cluster and Black Hole in the Late-Type Spiral Galaxy NGC 3621

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NGC 3621 is a late-type (Sd) spiral galaxy with an active nucleus, previously detected through mid-infrared [Ne V] line emission. Archival *Hubble Space Telescope* (*HST*) images reveal that the galaxy contains a bright and compact nuclear star cluster. We present a new high-resolution optical spectrum of this nuclear cluster, obtained with the ESI Spectrograph at the Keck Observatory. The nucleus has a Seyfert 2 emission-line spectrum at optical wavelengths, supporting the hypothesis that a black hole is present. The line-of-sight stellar velocity dispersion of the cluster is $\sigma_\star = 43 \pm 3$ km s^{-1}, one of the largest dispersions measured for any nuclear cluster in a late-type spiral galaxy. Combining this measurement with structural parameters measured from archival *HST* images, we carry out dynamical modeling based on the Jeans equation for a spherical star cluster containing a central point mass. The maximum black hole mass consistent with the measured stellar velocity dispersion is 3×10^6 $M_\odot$. If the black hole mass is small compared with the cluster's stellar mass, then the dynamical models imply a total stellar mass of $\sim 1 \times 10^7$ $M_\odot$, which is consistent with rough estimates of the stellar mass based on photometric measurements from *HST* images. From structural decomposition of 2MASS images, we find no clear evidence for a bulge in NGC 3621; the galaxy contains at most a very faint and inconspicuous pseudobulge component ($M_K > -17.6$ mag). NGC 3621 provides one of the best demonstrations that very late-type spirals can host both active nuclei and nuclear star clusters, and that low-mass black holes can occur in disk galaxies even in the absence of a substantial bulge.

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E-mail contact: barth@uci.edu,
preprint available at http://arxiv.org/abs/0809.1066

The Accuracy of Supermassive Black Hole Masses Determined by the Single-Epoch-Spectrum (Dibai) Method

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The first set of supermassive black hole mass estimates, publishedfrom 1980 to 1984 by É. A. Dibai, are shown to be in excellentagreement with recent reverberation-mapping estimates. Comparisonof the masses of 17 AGNs covering a mass range from about 10^6 to10^9 solar masses shows that the Dibai mass estimates agree withreverberation-mapping mass estimates to significantly better than$\pm$0.3 dex and were, on average, only 0.14 dex ($\sim$ 40%)systematically lower than masses obtained from reverberationmapping. This surprising agreement with the results of over aquarter of a century ago has important implication for the structureand kinematics of AGNs and implies that AGNs are very similar. Ourresults give strong support to the use of the single-epoch-spectrum(Dibai) method for investigating the co-evolution of supermassiveblack holes and their host galaxies.

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E-mail contact: gaskell@astro.as.utexas.edu,
preprintavailable at http://arxiv.org/abs/0809.4742

On the nature of an ejection event in the jet of 3C 111

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We present a possible scenario for the ejection of a superluminal component in the jet of the Broad Line Radio Galaxy 3C 111 in early 1996. VLBI observations at 15 GHz discovered the presence of two jet features on scales smaller than one parsec. The first component evolves downstream, whereas the second one fades out after 1 parsec. We propose the injection of a perturbation of dense material followed by a decrease in the injection rate of material in the jet as a plausible explanation. This scenario is supported by 1D relativistic hydrodynamic and emission simulations. The perturbation is modeled as an increase in the jet density, without modifying the original Lorentz factor in the initial conditions. We show that an increase of the Lorentz factor in the material of the perturbation fails to reproduce the observed evolution of this flare. We are able to estimate the lifetime of the ejection event in 3C 111 to be 36 ± 7 days.

Recently published in Astronomy & Astrophysics (Letters to the Editor, 2008, vol. 489, pag. L29)

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preprint available at http://arxiv.org/abs/0808.3314

Efficient Photometric Selection of Quasars from the Sloan Digital Sky Survey: II. ~1,000,000 Quasars from Data Release Six

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We present a catalog of 1,172,157 quasar candidates selected from the photometric imaging data of the Sloan Digital Sky Survey (SDSS). The objects are all point sources to a limiting magnitude of $i = 21.3$ from 8417 sq. deg. of imaging from SDSS Data Release 6 (DR6). This sample extends our previous catalog by using the latest SDSS public release data and probing both UV-excess and high-redshift quasars. While the addition of high-redshift candidates reduces the overall efficiency (quasars:quasar candidates) of the catalog to ~80%, it is expected to contain no fewer than 850,000 bona fide quasars — ~8 times the number of our previous sample, and ~10 times the size of the largest spectroscopic quasar catalog. Cross-matching between our photometric catalog and spectroscopic quasar catalogs from both the SDSS and 2dF Surveys, yields 88,879 spectroscopically confirmed quasars. For judicious selection of the most robust UV-excess sources (~500,000 objects in all), the efficiency is nearly 97% – more than sufficient for detailed statistical analyses. The catalog's completeness to type 1 (broad-line) quasars is expected to be no worse than 70%, with most missing objects occurring at $z < 0.7$ and $2.5 < z < 3.0$. In addition to classification information, we provide photometric redshift estimates (typically good to $\Delta \pm 0.3$ $[2\sigma]$) and cross-matching with radio, X-ray, and proper motion catalogs. Finally, we consider the catalog's utility for determining the optical luminosity function of quasars and are able to confirm the flattening of the bright-end slope of the quasar luminosity function at $z \sim 4$ as compared to $z \sim 2$.

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E-mail contact: gtr@physics.drexel.edu,
preprint available at http://arxiv.org/abs/0809.3952; catalog files at
http://www.physics.drexel.edu/ gtr/outgoing/nbckde/tab1.dat.bz2 and
http://www.physics.drexel.edu/ gtr/outgoing/nbckde/tab3.dat.bz2

Jobs

Postdoctoral Research Position, University of Kentucky

with Prof. Moshe Elitzur

at Physics & Astronomy Department, University of Kentucky, Lexington, KY 40506-0055, USA

Applications are invited for a postdoctoral research position in theoretical astrophysics to work with Prof. Moshe Elitzur at the University of Kentucky. The start date is around September 2009. Interest in AGN and radiative processes is advantageous. Applicants should send curriculum vita, bibliography and a statement of research interests by e-mail to moshe@pa.uky.edu and arrange for three letters of recommendation to be sent the same way. The initial appointment is for one year, with an expected extension for another year. The review of applications will start at the end of December, and will be continued until the position is filled.

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