Active Galaxies Newsletter	*An electronic publication dedicated to the observation and theory of active galaxies*
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From the Editor

The Active Galaxies Newsletter is produced monthly. The deadline for contributions is the last day 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.

Melanie Gendre

Abstracts of recently accepted papers

1ES 0229+200: An extreme blazar with a very high minimum Lorentz factor

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The blazar 1ES 0229+200 is a high frequency peaked BL Lac object with a hard TeV spectrum extending to 10 TeV. Its unusual spectral characteristics make it a frequently used probe for intergalactic radiation and magnetic fields. With new, simultaneous observations in the optical, ultraviolet (UV) and X-rays, the synchrotron emission is probed in great detail. The X-ray emission varies by a factor of ≈ 2 in 2009, while being rather stable in 2010. The X-ray spectrum is very hard ($\Gamma \approx 1.8$) and it shows an indication of excess absorption above the Galactic value. The X-ray emission is detected up to ~ 100 keV without any significant cut-off, thus 1ES 0229+200 belongs to the class of extreme blazars. The simultaneous measured, host galaxy- and extinction-corrected optical and UV fluxes illustrate that the cut-off of the low energy part of the synchrotron emission is located in the UV regime. The minimum energy of the electron distribution has to be rather high to account for this cut-off. This implies that there is a narrow-band energy distribution function of radiating electrons, which is responsible for the unusually hard TeV spectrum. Other extreme blazars have similar synchrotron peak frequencies but much softer TeV spectra, hence 1ES 0229+200 has one of the highest inverse Compton (IC) peak frequency and the narrowest electron distribution among the extreme blazars known to date.

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preprint available at arXiv:1109.3628

Simultaneous multi-wavelength campaign on PKS 2005-489 in a high state

The H.E.S.S. and *Fermi* LAT Collaboration

The high-frequency peaked BL Lac object PKS 2005-489 was the target of a multi-wavelength campaign with simultaneous observations in the TeV γ-ray (H.E.S.S.), GeV γ-ray (*Fermi*/LAT), X-ray (*RXTE*, *Swift*), UV (*Swift*) and optical (ATOM, *Swift*) bands. This campaign was carried out during a high flux state in the synchrotron regime. The flux in the optical and X-ray bands reached the level of the historical maxima. The hard GeV spectrum observed with *Fermi*/LAT connects well to the very high energy (VHE, E> 100 GeV) spectrum measured with H.E.S.S. with a peak energy between ~ 5 and 500 GeV. Compared to observations with contemporaneous coverage in the VHE and X-ray bands in 2004, the X-ray flux was ~ 50 times higher during the 2009 campaign while the TeV γ-ray flux shows marginal variation over the years. The spectral energy distribution during this multi-wavelength campaign was fit by a one zone synchrotron self-Compton model with a well determined cutoff in X-rays. The parameters of a one zone SSC model are inconsistent with variability time scales. The variability behaviour over years with the large changes in synchrotron emission and small changes in the inverse Compton emission does not warrant an interpretation within a one-zone SSC model despite an apparently satisfying fit to the broadband data in 2009.

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preprint available at arXiv:1111.3331

The merger history, AGN and dwarf galaxies of Hickson Compact Group 59

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Compact group galaxies often appear unaffected by their unusually dense environment. Closer examination can, however, reveal the subtle, cumulative effects of multiple galaxy interactions. Hickson Compact Group (HCG) 59 is an excellent example of this situation. We present a photometric study of this group in the optical (*HST*), infrared (*Spitzer*) and X-ray (*Chandra*) regimes aimed at characterizing the star formation and nuclear activity in its constituent galaxies and intra-group medium. We associate five dwarf galaxies with the group and update the velocity dispersion, leading to an increase in the dynamical mass of the group of up to a factor of 10 (to 2.8×10^{13} $M_\odot$), and a subsequent revision of its evolutionary stage. Star formation is proceeding at a level consistent with the morphological types of the four main galaxies, of which two are star-forming and the other two quiescent. Unlike in some other compact groups, star-forming complexes across HCG 59 closely follow mass-radius scaling relations typical of nearby galaxies. In contrast, the ancient globular cluster populations in galaxies HCG 59A and B show intriguing irregularities, and two extragalactic H II regions are found just west of B. We age-date a faint stellar stream in the intra-group medium at ~ 1 Gyr to examine recent interactions. We detect a likely low-luminosity AGN in HCG 59A by its $\sim 10^{40}$ erg s^{-1} X-ray emission; the active nucleus rather than star formation can account for the UV+IR SED. We discuss the implications of our findings in the context of galaxy evolution in dense environments.

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X-ray and Multiwavelength Insights into the Nature of Weak Emission-Line Quasars at Low Redshift

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We report on the X-ray and multiwavelength properties of 11 radio-quiet quasars with weak or no emission lines identified by the Sloan Digital Sky Survey (SDSS) with redshift $z = 0.4$–2.5. Our sample was selected from the Plotkin et al. catalog of radio-quiet, weak-featured AGNs. The distribution of relative X-ray brightness for our low-redshift weak-line quasar (WLQ) candidates is significantly different from that of typical radio-quiet quasars, having an excess of X-ray weak sources, but it is consistent with that of high-redshift WLQs. Over half of the low-redshift WLQ candidates are X-ray weak by a factor of > 5, compared to a typical SDSS quasar with similar UV/optical luminosity. These X-ray weak sources generally show similar UV emission-line properties to those of the X-ray weak quasar PHL 1811 (weak and blueshifted high-ionization lines, weak semi-forbidden lines, and strong UV Fe emission); they may belong to the notable class of PHL 1811 analogs. The average X-ray spectrum of these sources is somewhat harder than that of typical radio-quiet quasars. Several other low-redshift WLQ candidates have normal ratios of X-ray-to-optical/UV flux, and their average X-ray spectral properties are also similar to those of typical radio-quiet quasars. The X-ray weak and X-ray normal WLQ candidates may belong to the same subset of quasars having high-ionization "shielding gas" covering most of the wind-dominated broad emission-line region, but be viewed at different inclinations. The mid-infrared-to-X-ray spectral energy distributions (SEDs) of these sources are generally consistent with those of typical SDSS quasars, showing that they are not likely to be BL Lac objects with relativistically boosted continua and diluted emission lines. The mid-infrared-to-UV SEDs of most radio-quiet weak-featured AGNs without sensitive X-ray coverage (34 objects) are also consistent with those of typical SDSS quasars. However, one source in our X-ray observed sample is remarkably strong in X-rays, indicating that a small fraction of low-redshift WLQ candidates may actually be BL Lacs residing in the radio-faint tail of the BL Lac population. We also investigate universal selection criteria for WLQs over a wide range of redshift, finding that it is not possible to select WLQ candidates in a fully consistent way using different prominent emission lines (e.g., Lyα, C IV, Mg II, and Hβ) as a function of redshift.

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preprint available at http://arxiv.org/abs/1112.2228

Evidence for Three Accreting Black Holes in a Galaxy at z$\sim$1.35[1]: A Snapshot of Recently Formed Black Hole Seeds?

[1]Based on observations made with the NASA/ESA Hubble Space Telescope, obtained from the data archive at the Space Telescope Institute. STScI is operated by the association of Universities for Research in Astronomy, Inc. under the NASA contract NAS 5-26555.

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One of the key open questions in cosmology today pertains to understanding when, where and how super massive black holes form, while it is clear that mergers likely play a significant role in the growth cycles of black holes, how supermassive black holes form, and how galaxies grow around them. Here, we present *Hubble Space Telescope* WFC3/IR grism observations of a clumpy galaxy at $z = 1.35$, with evidence for $10^6 - 10^7 M_\odot$ rapidly growing black holes in separate sub-components of the host galaxy. These black holes could have been brought into close proximity as a consequence of a rare multiple galaxy merger or they could have formed in situ. Such holes would eventually merge into a central black hole as the stellar clumps/components presumably coalesce to form a galaxy bulge. If we are witnessing the in-situ formation of multiple black holes, their properties can inform seed formation models and raise the possibility that massive black holes can continue to emerge in star-forming galaxies as late as $z = 1.35$ (4.8 Gyr after the Big Bang).

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Erratic Jet Wobbling in the BL Lacertae Object OJ287 Revealed by Sixteen Years of 7 mm VLBA Observations

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We present the results from an ultra-high-resolution 7 mm Very Long Baseline Array (VLBA) study of the relativistic jet in the BL Lacertae object OJ287 from 1995 to 2011 containing 136 total intensity images. Analysis of the image sequence reveals a sharp jet-position-angle swing by $> 100^\circ$ during [2004,2006], as viewed in the plane of the sky, that we interpret as the crossing of the jet from one side of the line of sight to the other during a softer and longer term swing of the inner jet. Modulating such long term swing, our images also show for the first time a prominent erratic wobbling behavior of the innermost ~ 0.4 mas of the jet with fluctuations in position angle of up to $\sim 40^\circ$ over time scales ~ 2 yr. This is accompanied by highly superluminal motions along non-radial trajectories, which reflect the remarkable non-ballistic nature of the jet plasma on these scales. The erratic nature and short time scales of the observed behavior rules out scenarios such as binary black hole systems, accretion disk precession, and interaction with the ambient medium as possible origins of the phenomenon on the scales probed by our observations, although such processes may cause longer-term modulation of the jet direction. We propose that variable asymmetric injection of the jet flow; perhaps related to turbulence in the accretion disk; coupled with hydrodynamic instabilities, leads to the non-ballistic dynamics that cause the observed non-periodic changes in the direction of the inner jet.

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AMUSE-Field I: Nuclear X-ray Properties of Local Field and Group Spheroids across the Stellar Mass Scale

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We present the first results from AMUSE-Field, a *Chandra* survey designed to characterize the occurrence and intensity of low-level accretion onto supermassive black holes (SMBHs) at the center of local early-type field galaxies. This is accomplished by means of a Large Program targeting a distance-limited (<30 Mpc) sample of 103 early types spanning a wide range in stellar masses. We acquired new ACIS-S observations for 61 objects down to a limiting (0.3–10 keV) luminosity of 2.5×10^{38} erg s^{-1}, and we include an additional 42 objects with archival (typically deeper) coverage. A nuclear X-ray source is detected in 52 out of the 103 galaxies. After accounting for potential contamination from low-mass X-ray binaries, we estimate that the fraction of accreting SMBHs within the sample is $45 \pm 7\%$, which sets a firm lower limit on the occupation fraction within the field. The measured nuclear X-ray luminosities are invariably highly sub-Eddington, with $L_{\rm X}/L_{\rm Edd}$ ratios between $\sim 10^{-4}$–10^{-8}. As also found in a companion survey targeting Virgo early types, the active fraction increases with increasing host galaxy stellar mass, reflective of "Eddington incompleteness" within the lower-mass objects. For the Field sample, the average nuclear X-ray luminosity scales with the host stellar mass as $M_{\rm star}^{0.71\pm0.10}$, with an intrinsic scatter of 0.73 ± 0.09 dex. Qualitatively similar results hold for morphologically homogeneous (type E) or uniform sensitivity (new observations only) subsets. A majority of the AMUSE-Field galaxies (78%) inhabits groups, enabling us to investigate the influence of group richness upon nuclear activity. We see no evidence for a positive correlation between nuclear X-ray luminosity, normalized to host properties, and galaxy density. Rather, while the scatter is substantial, it appears that the Eddington-scaled X-ray luminosity of group members may be slightly lower than for isolated galaxies, and that this trend continues to cluster early-types.

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The role of environment in low-level AGN activity: no evidence for cluster enhancement

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We use the AMUSE-Virgo and AMUSE-Field surveys for nuclear X-ray emission in early-type galaxies to conduct a controlled comparison of low-level supermassive black hole activity within cluster and field spheroids. While both the Virgo and the Field samples feature highly sub-Eddington X-ray luminosities ($L_{\rm X}/L_{\rm Edd}$ between $\sim 10^{-8} - 10^{-4}$), we find that after accounting for the influence of host galaxy stellar mass, the field early-type galaxies tend toward marginally greater (0.38 ± 0.14 dex) nuclear X-ray luminosities, at a given black hole mass, than their cluster counterparts. This trend is qualitatively consistent with the field black holes having access to a greater reservoir of fuel, plausibly in the form of cold gas located near the nucleus. We are able to rule out at high confidence the alternative of enhanced X-ray activity within clusters. Presuming nuclear X-ray emission correlates with the total energy and momentum output of these weakly accreting black holes, this indicates that low-level AGN feedback is not generally stronger within typical cluster galaxies than in the field. These results confirm that for most cluster early-type galaxies (i.e., excluding brightest cluster galaxies) direct environmental effects, such as gas stripping, are more relevant in quenching star formation.

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Jobs Adverts

Assistant Professor of Extragalactic Astronomy
Georgia State University

The Department of Physics and Astronomy anticipates filling a tenure track position in extragalactic astronomy at the rank of Assistant Professor for the 2012-13 academic year, pending budgetary approval. The department presently consists of 23 faculty members with two major research groups in the astronomy area: extragalactic astronomy and stellar astronomy. The successful applicant should have the following minimum requirements: (1) Ph.D. degree in astronomy, astrophysics or related field; (2) post-doctoral and research/teaching experience commensurate with rank; and (3) evidence of the ability to establish and maintain a successful research program in extragalactic astronomy which complements existing research programs in the department. Current faculty in extragalactic astronomy include Dick Miller, Mike Crenshaw, and Misty Bentz. More information can be found at www.chara.gsu.edu. In order to receive full consideration, applications should be received by Jan 31, 2012 and should include: (1) cover letter, (2) CV, (3) names of three references, and (4) statements of the candidate's teaching philosophy, research interests, and a description of how their research program would complement existing research programs in astronomy at GSU. These materials should be sent to the attention of H. Richard Miller (miller@chara.gsu.edu), Dept. of Physics and Astronomy, Georgia State University, University Plaza, Atlanta, GA 30303. This position will remain open until filled. An offer of employment will be conditional on background verification. Georgia State University, a unit of the University System of Georgia, is an equal opportunity educational institution, and an EEO/AA employer.

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Special Announcements

AGN Proposals for HST why are we not getting time?

While reading the latest STScI Newsletter, I noticed something that I think all AGN aficionados should be concerned about: namely, why are our HST proposals not getting accepted? A look through the statistics shows that we have a significant problem: in Cycle 19, AGN science was 9% of orbits proposed, but only 5% of accepted orbits, while in Cycle 18, AGN science was 11% of orbits proposed, but 5% of accepted orbits.

I have established a tumblr forum to foster discussion amongst the AGN community about this and other relevant topics. If you wish to contribute to the discussion, please go to activegalaxies.tumblr.com.

Please note that this is the initial discussion for the site - if others want to take it in a different direction after the HST proposal deadline, that's fine, but I think this topic is a good place to start. In my mind the relevant questions are:

- Is there a trend that we can spot in our comments?
- Are there scientific points that are not getting across to the larger HST community?
- Is there a bandwagon effect or is some other unintended bias affecting the results?
- Do improvements need to be made in the HST reviewing process?

With the HST deadline for Cycle 20 only two months away (February 24, 2012), this discussion is highly topical. Please post your reflections and lets help each other. We wont all get time, but we can help our community get its fair share of time and in the process turn the HST community back "on" to AGN science.

Eric Perlman