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 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.

Janine van Eymeren

Abstracts of recently accepted papers

The radio properties of infrared-faint radio sources

Enno Middelberg[1], Ray P. Norris[2], Christopher A. Hales[3,2], Nick Seymour[4], Melanie Johnston-Hollitt[5], Minh T. Huynh[6], Emil Lenc[2] and Minnie Y. Mao[7]

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Infrared-faint radio sources (IFRS) are objects that have flux densities of several mJy at 1.4GHz, but that are invisible at 3.6um when using sensitive Spitzer observations with uJy sensitivities. Their nature is unclear and difficult to investigate since they are only visible in the radio. High-resolution radio images and comprehensive spectral coverage can yield constraints on the emission mechanisms of IFRS and can give hints to similarities with known objects. We imaged a sample of 17 IFRS at 4.8GHz and 8.6GHz with the Australia Telescope Compact Array to determine the structures on arcsecond scales. We added radio data from other observing projects and from the literature to obtain broad-band radio spectra. We find that the sources in our sample are either resolved out at the higher frequencies or are compact at resolutions of a few arcsec, which implies that they are smaller than a typical galaxy. The spectra of IFRS are remarkably steep, with a median spectral index of -1.4 and a prominent lack of spectral indices larger than -0.7. We also find that, given the IR non-detections, the ratio of 1.4GHz flux density to 3.6um flux density is very high, and this puts them into the same regime as high-redshift radio galaxies. The evidence that IFRS are predominantly high-redshift sources driven by active galactic nuclei (AGN) is strong, even though not all IFRS may be caused by the same phenomenon. Compared to the rare and painstakingly collected high-redshift radio galaxies, IFRS appear to be much more abundant, but less luminous, AGN-driven galaxies at similar cosmological distances.

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E-mail contact: middelberg@astro.rub.de, preprint available at http://arxiv.org/abs/1011.2391

Monte Carlo simulations of the Nickel Kα fluorescent emission line in a toroidal geometry

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We present new results from Monte Carlo calculations of the flux and equivalent width (EW) of the Ni Kα fluorescent emission line in the toroidal X-ray reprocessor model of Murphy & Yaqoob (2009, MNRAS, 397, 1549). In the Compton-thin regime, the EW of the Ni Kα line is a factor of ~ 22 less than that of the Fe Kα line but this factor can be as low as ~ 6 in the Compton-thick regime. We show that the optically-thin limit for this ratio depends only on the Fe to Ni abundance ratio, it being independent of the geometry and covering factor of the reprocessor, and also independent of the shape of the incident X-ray continuum. We give some useful analytic expressions for the absolute flux and the EW of the Ni Kα line in the optically-thin limit. When the reprocessor is Compton-thick and the incident continuum is a power-law with a photon index of 1.9, the Ni Kα EW has a maximum value of ~ 3 eV and ~ 250 eV for non-intercepting and intercepting lines-of-sight respectively. Larger EWs are obtained for flatter continua. We have also studied the Compton shoulder of the Ni Kα line and find that the ratio of scattered to unscattered flux in the line has a maximum value of 0.26, less than the corresponding maximum for the Fe Kα line. However, we find that the shape of the Compton shoulder profile for a given column density and inclination angle of the torus is similar to the corresponding profile for the Fe Kα line. Our results will be useful for interpreting X-ray spectra of active galactic nuclei (AGNs) and X-ray binary systems in which the system parameters are favorable for the Ni Kα line to be detected.

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E-mail contact: yaqoob at pha. jhu. edu, preprint available at arXiv

Witnessing the key early phase of quasar evolution: an obscured AGN pair in the interacting galaxy IRAS 20210+1121

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We report the discovery of an active galactic nucleus (AGN) pair in the interacting galaxy system IRAS 20210+1121 at $z = 0.056$. An *XMM-Newton* observation reveals the presence of an obscured ($N_H \sim 5 \times 10^{23}$ cm^{-2}), Seyfert-like ($L_{2-10keV} = 4.7 \times 10^{42}$ erg s^{-1}) nucleus in the northern galaxy, which lacks unambiguous optical AGN signatures. Our spectral analysis also provides strong evidence that the IR-luminous southern galaxy hosts a Type 2 quasar embedded in a bright starburst emission. In particular, the X-ray primary continuum from the nucleus appears totally depressed in the *XMM-Newton* band as expected in case of a Compton-Thick absorber, and only the emission produced by Compton scattering ("reflection") of the continuum from circumnuclear matter is seen. As such, IRAS 20210+1121 seems to provide an excellent opportunity to witness a key, early phase in the quasar evolution predicted by the theoretical models of quasar activation by galaxy collisions.

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preprint available at http://arxiv.org/abs/1008.3987

HST Observations of the Double-Peaked Emission Lines in the Seyfert Galaxy Markarian 78: Mass Outflows from a Single AGN

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Previous ground based observations of the Seyfert 2 galaxy Mrk 78 revealed a double set of emission lines, similar to those seen in several active galactic nuclei (AGN) from recent surveys. Are the double lines due to two AGN with different radial velocities in the same galaxy, or are they due to mass outflows from a single AGN? We present a study of the outflowing ionized gas in the resolved narrow-line region (NLR) of Mrk 78 using observations from Space Telescope Imaging Spectrograph (STIS) and Faint Object Camera (FOC) aboard the *Hubble Space Telescope(HST)* as part of an ongoing project to determine the kinematics and geometries of AGN outflows. From the spectroscopic information, we determined the fundamental geometry of the outflow via our kinematics modeling program by recreating radial velocities to fit those seen in four different STIS slit positions. We determined that the double emission lines seen in ground-based spectra are due to an asymmetric distribution of outflowing gas in the NLR. By successfully fitting a model for a single AGN to Mrk 78, we show that it is possible to explain double emission lines with radial velocity offsets seen in AGN similar to Mrk 78 without requiring dual supermassive black holes.

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E-mail contact: fischer@chara.gsu.edu,
preprint available at http://xxx.lanl.gov/abs/1011.4213

The Sudden Death of the Nearest Quasar

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Galaxy formation is significantly modulated by energy output from supermassive black holes at the centers of galaxies which grow in highly efficient luminous quasar phases. The timescale on which black holes transition into and out of such phases is, however, unknown. We present the first measurement of the shutdown timescale for an individual quasar using X-ray observations of the nearby galaxy IC 2497, which hosted a luminous quasar no more than 70,000 years ago that is still seen as a

light echo in 'Hanny's Voorwerp', but whose present-day radiative output is lower by at least 2 and more likely by over 4 orders of magnitude. This extremely rapid shutdown provides new insights into the physics of accretion in supermassive black holes, and may signal a transition of the accretion disk to a radiatively inefficient state.

Schawinski, K., et al. 2010, ApJ, 724, L30

E-mail contact: agnews@manchester.ac.uk,
preprint available at arXiv:1011.0427

The connection between black hole mass and Doppler boosted emission in BL Lacertae type objects

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We investigate the relationship between black hole mass (M_{BH}) and Doppler boosted emission for BL Lacertae type objects (BL Lacs) detected in the SDSS and FIRST surveys. The synthesis of stellar population and bidimensional decomposition methods allows us to disentangle the components of the host galaxy from that of the nuclear black hole in their optical spectra and images, respectively. We derive estimates of black hole masses via stellar velocity dispersion and bulge luminosity. We find that masses delivered by both methods are consistent within errors. There is no difference between the black hole mass ranges for high-synchrotron peaked BL Lacs (HBL) and low-synchrotron peaked BL Lacs (LBL). A correlation between the black-hole mass and radio, optical and X-ray luminosity has been found at a high significance level. The optical-continuum emission correlates with the jet luminosity as well. Besides, X-ray and radio emission are correlated when HBLs and LBLs are considered separately. Results presented in this work: (i) show that the black hole mass does not decide the SED shapes of BL Lacs, (ii) confirm that X-ray and optical emission is associated to the relativistic jet, and (iii) present evidence of a relation between M_{BH} and Doppler boosted emission, which among BL Lacs may be understood as a close relation between faster jets and more massive black holes.

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E-mail contact: leon@kurp.hut.fi,
preprint available at http://adsabs.harvard.edu/abs/2010arXiv1009.6195L

Multi-wavelength Probes of Obscuration Towards the Narrow Line Region in Seyfert Galaxies

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We present a study of reddening and absorption towards the Narrow Line Regions (NLR) in active galactic nuclei (AGN) selected from the Revised Shapley-Ames, 12μm, and *Swift*/Burst Alert Telescope samples. For the sources in host galaxies with inclinations of $b/a > 0.5$, we find that mean ratio of [O III] λ5007, from ground-based observations, and [O IV] 28.59μm, from *Spitzer*/Infrared Spectrograph observations, is a factor of 2 lower in Seyfert 2s than Seyfert 1s. The combination of low [O III]/[O IV] and [O III] λ4363/λ5007 ratios in Seyfert 2s suggests more extinction of emission from the NLR than in Seyfert 1s. Similar column densities of dusty gas, $N_H \sim$ several $\times$ 10^{21} cm^{-2}, can account for the suppression of both [O III] λ5007 and [O III] λ4363, as compared to those observed in Seyfert 1s. Also, we find that the X-ray line O VII λ22.1 Å is weaker in Seyfert 2s, consistent with absorption by the same gas that reddens the optical emission. Using a *Hubble Space Telescope*/Space Telescope Imaging Spectrograph slitless spectrum of the Seyfert 1 galaxy NGC 4151, we estimate that only $\sim$ 30% of the [O III]

λ5007 comes from within 30 pc of the central source, which is insufficient to account for the low [O III]/[O IV] ratios in Seyfert 2s. If Seyfert 2 galaxies have similar intrinsic [O III] spatial profiles, the external dusty gas must extend further out along the NLR, perhaps in the form of nuclear dust spirals that have been associated with fueling flows towards the AGN.

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Radio Properties of Low Redshift Broad Line Active Galactic Nuclei Including Extended Radio Sources

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We present a study of the extended radio emission in a sample of 8434 low redshift (z < 0.35) broad line active galactic nuclei (AGN) from the Sloan Digital Sky Survey (SDSS). To calculate the jet and lobe contributions to the total radio luminosity, we have taken the 846 radio core sources detected in our previous study of this sample and performed a systematic search in the Faint Images of the Radio Sky at Twenty-centimeters (FIRST) database for extended radio emission that is likely associated with the optical counterparts. We found 51 out of 846 radio core sources have extended emission ($> 4''$ from the optical AGN) that is positively associated with the AGN, and we have identified an additional 12 AGN with extended radio emission but no detectable radio core emission. Among these 63 AGN, we found 6 giant radio galaxies (GRGs), with projected emission exceeding 750 kpc in length, and several other AGN with unusual radio morphologies also seen in higher redshift surveys. The optical spectra of many of the extended sources are similar to that of typical broad line radio galaxy spectra, having broad Hα emission lines with boxy profiles and large M_{BH}. With extended emission taken into account, we find strong evidence for a bimodal distribution in the radio-loudness parameter $\mathcal{R}$ ($\equiv \nu_{radio}L_{radio}/\nu_{opt}L_{opt}$), where the lower radio luminosity core-only sources appear as a population separate from the extended sources, with a dividing line at $\log(\mathcal{R}) \approx 1.75$. This dividing line ensures that these are indeed the most radio-loud AGN, which may have different or extreme physical conditions in their central engines when compared to the more numerous radio quiet AGN.

SUBMITTED to A.J. on November 28th 2010

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Jobs

2011 Carnegie Observatories Graduate Research Fellowship

We announce the inauguration of the Graduate Research Fellowship at the Carnegie Observatories in Pasadena, California. This Fellowship provides a stipend to graduate students interested in carrying out all or part of their thesis research under the supervision of a Carnegie Staff member, in residence at Carnegie. We encourage applications from current Ph.D. graduate students in astronomy from an accredited (US or non-US) university, pursuing thesis research in observational astronomy, theoretical astrophysics, or instrumentation development. The student must have completed all requisite coursework and examinations prior to arriving at Carnegie. The Fellowship, beginning in September, 2011, will be awarded for one year and may be renewed for two additional years.

Carnegie Observatories provides a vibrant environment for vigorous scientific research and academic excellence. Major areas of research include cosmology and the distance scale, physics of active galactic nuclei, searches for massive black holes, galaxy formation and evolution, galaxy groups and clusters, intergalactic medium, star formation, supernovae, star clusters, and nucleosynthesis and chemical abundances of stars.

Carnegie observing facilities at Las Campanas Observatory in Chile include the two 6.5-meter Magellan telescopes, the 2.5-meter du Pont telescope, and the Swope 1.0-meter telescope. In addition, the scientific Staff actively pursues research using a wide range of ground-based and space-based facilities, across the electromagnetic spectrum from radio to X-rays.

The application should include a curriculum vitae, bibliography, brief essay describing the applicant's current research, research proposal based on a project sponsored by a Carnegie Staff member, transcript of grades, approval letter from the department head of the applicant's home institution, and three letters of reference. Applications are due by April 15, 2011, 17:00 PST. Full details of the program and application instructions can be found at this web site: http://obs.carnegiescience.edu/gradfellowships/. Email inquiries may be sent to Dr. Luis Ho at gradfellowships@obs.carnegiescience.edu.

E-mail contact: gradfellowships@obs.carnegiescience.edu

Meetings

Beamed and Umbeamed Gamma-Rays from Galaxies

Hotel Olos, Muonio, Finland
2011 April 11-15

Webpage: `http://www.astroparticlephysics.info/gfg2011/`
Email: `gfg2011@astroparticlephysics.info`

Both the number and types of extragalactic very-high energy gamma-ray emitters has increased substantially during the last few years. This international scientific workshop is aimed at reviewing and discussing the current knowledge and understanding of gamma-ray emission both from active and other types of galaxies (e.g., starburst galaxies) particularly in the light of results delivered recently from high-energy and very-high energy gamma-ray instruments instruments as well as multiwavelength studies.

The workshop will consist of invited review talks, contributed talks, and round table discussions to exchange facts and ideas and facilitate new cooperations. It will also facilitate communication between theorists, phenomenologists and observers.

Scientific scope and topics:

- Blazars and jetted AGNs
- Blazar and AGN Physics, Observations, Phenomenology
- Black hole and central engine
- Jets and environment of the central engine
- Non-blazar AGNs
- Non-AGN galaxies: star-forming and starburst galaxies, cosmic-ray generation
- Observational tools: Variability, Correlations, Power Spectra Analysis, Periodicity
- Multiwavelength aspects and approaches: Radio, optical, X-rays along with GeV/TeV Gamma-rays
- Future observational opportunities
- EBL status and progress

For information, registration and abstract submission, please visit `http://www.astroparticlephysics.info/gfg2011/`