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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.
Also I would like to thank all of the contributers and subscribers to the newsletter, without whom, there would be no newsletter, thank you and seasons greetings to you all.

Rob Beswick

Abstracts of recently accepted papers

Stellar population gradients in Seyfert 2 galaxies. Northern sample

D. Raimann[1], T. Storchi-Bergmann[1], R.M. González Delgado[2], R. Cid Fernandes[3], T. Heckman[4], C. Leitherer[5] and H. Schmitt[6,7]

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We use high signal-to-noise ratio long-slit spectra in the $\lambda\lambda$3600-4700 Å range of the twenty brightest northern Seyfert 2 galaxies to study the variation of the stellar population properties as a function of distance from the nucleus. In order to characterize the stellar population and other continuum sources (e.g. featureless continuum FC) we have measured equivalent widths Ws of six absorption features, four continuum colours and their radial variations, and performed spectral population synthesis as a function of distance from the nucleus. About half the sample has CaIIK and G-band W values smaller at the nucleus than at 1 kpc from it, due to a younger population and/or FC. The stellar population synthesis shows that, while at the nucleus, 75 per cent of the galaxies present contribution $>$20 per cent of ages $\leq$100 Myr and/or of a FC, this proportion decreases to 45 per cent at 3 kpc. In particular, 55 per cent of the galaxies have contribution $>$10 per cent of the 3 Myr/FC component (a degenerate component in which one cannot separate what is due to a FC or to a 3 Myr stellar population) at the nucleus, but only 25 per cent of them have this contribution at 3 kpc. As reference, the stellar population of 10 non-Seyfert galaxies, spanning the Hubble types of the Seyfert (from S0 to Sc) was also studied. A comparison between the stellar population of the Seyferts and that of the non-Seyferts shows systematic differences: the contribution of ages younger than 1 Gyr is in most cases larger in the Seyfert galaxies than in non-Seyferts, not only at the nucleus but up to 1 kpc from it.

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Detection of Optical Synchrotron Emission from the Radio Jet of 3C 279

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We report the detection of optical and ultraviolet emission from the kiloparsec scale jet of the well-known quasar 3C 279. A bright knot, discovered in archival V and U band *Hubble Space Telescope* Faint Object Camera images, is coincident with a peak in the radio jet ~0.6" from the nucleus. The detection was also confirmed in Wide Field Planetary Camera-2 images. Archival Very Large Array and MERLIN radio data are also analyzed which help to show that the high-energy optical/UV continuum, and spectrum, are consistent with a synchrotron origin from the same population of relativistic electrons responsible for the radio emission.

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An Optical Spectroscopic Atlas of Low Redshift Active Galactic Nuclei

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We present a spectral atlas of the Hβ region for 215 type 1 AGN (luminous Seyfert 1/radio galaxy nuclei and low-z quasars) up to z$\approx$ 0.8. Line profiles and measures were derived from the database of intermediate resolution spectra (R $\geq$ 1000) with average continuum level S/N ratio $\approx$ 30. Parameters including rest frame equivalent width and FWHM are provided for the $\mathrm{FeII_{opt}}$ blend at λ 4570, Hβ, HeIIλ4686 and the [OIII]$\lambda\lambda$4959,5007 emission lines. We extract clean broad component Hβ profiles and provide wavelength measurements at 0, 1/4, 1/2, 3/4 and 0.9 peak intensity levels in order to permit a quantitative definition of the Hβ broad component for statistical studies. We also discuss sources of uncertainty, selection effects and biases in our sample. The data are especially important for tests of the Eigenvector 1 parameter space occupation and correlation. We show that the I Zw1 template $\mathrm{FeII_{opt}}$ spectrum reproduces well the observed $\mathrm{FeII_{opt}}$ emission for a wide range of line width and strength. A detailed analysis of the data within the Eigenvector 1 context is deferred to a companion paper.

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`http://panoramix.pd.astro.it/~marziani/preprint_atlas.pdf`

Quasar Parallax: a Method for Determining Direct Geometrical Distances to Quasars

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We describe a novel method to determine direct geometrical distances to quasars that can measure the cosmological constant, Λ, with minimal assumptions. This method is equivalent to geometric parallax, with the 'standard length' being the size of the quasar broad emission line region (BELR) as determined from the light travel time measurements of reverberation mapping. diameter is large, 40% at z=2, so mapping angular diameter distances vs. redshift will give Λ with (relative) ease. measurements could be made in the UV, optical, near infrared or even X-ray bands. Interferometers with a resolution of 0.01 mas are needed to measure the size of the BELR in z=2 quasars, which appear plausible given reasonable short term extrapolations of current technology.

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Does the Narrow [O III] $\lambda 5007$ Line Reflect the Stellar Velocity Dispersion in AGN?

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It has been proposed that the width of the narrow [O III] $\lambda 5007$ emission line can be used as a surrogate for the stellar velocity dispersion in active galaxies. This proposition is tested using the SDSS EDR spectra of 107 low-redshift radio-quiet QSOs and Seyfert 1 galaxies by investigating the correlation between black hole mass, as determined from Hβ FWHM and optical luminosity, and [O III] FWHM. The correlation is real, but the scatter is large. Without additional information or selection criteria, the [O III] width can predict the black hole mass to a factor of 5.

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Emission and Absorption in the M87 LINER

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The nucleus of M87 displays a LINER spectrum at optical wavelengths, with a nuclear disk of nebulosity that is resolved by the *Hubble Space Telescope*. We present new results from optical and ultraviolet spectra of the central ~ 40 pc as measured by *HST*. In contrast with previous results for the extended disk, the emission-line spectrum of the central region is best reproduced by a multi-component photoionization scenario, rather than shock heating. The nebular properties as well as energetic considerations suggest a transition on scales of several tens of parsecs, from predominantly photoionization by a central accretion source, to shock ionization within the disk. If this source is at all representative, it suggests that many LINERs may be composite in terms of the energetic processes that give rise to the emission spectrum. We also report measurements of resonance-line absorption for the nucleus. The absorption spectrum, like the emission lines, is characterized by low ionization. The absorption line measurements coupled with independent constraints suggest a total hydrogen column density of $10^{19} - 10^{20}$ cm^{-2}, outflowing from the galaxy center with a velocity of ~ 126 km s^{-1}. The kinematic signature of an outflow, along with evidence that the absorber covers the power-law continuum source but not the emission-line clouds, suggests that the absorbing matter is related to accretion phenomena in the nucleus. The presence of such an outflow resembles similar behavior in luminous AGNs, although the low ionization that characterizes LINERs is probably indicative of a different mode of accretion in these sources.

Astrophysical J., in press

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The Independence of AGN Black Hole Mass and Radio-Loudness

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We revisit the issue of whether radio loudness in AGN is associated with central black hole mass, as has been suggested in the literature. We present new estimates of black hole mass for 295 AGN (mostly radio-quiet), calculating their radio loudnesses from published radio and optical fluxes, and combine with our previously published values, for a sample of 452 AGN for which both black hole mass and radio loudness (or upper limits thereto) are known. Among the radio-quiet AGN, there are now many black holes with mass larger than $10^9\ M_\odot$, extending to the same high black hole masses as radio-loud AGN of the same redshifts. Over the full sample, the black hole masses of radio-loud and radio-quiet AGN span the same large range, $10^6 - 10^{10} M_\odot$. We conclude that radio loudness in AGN does not depend strongly on central black hole mass.

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Very Light Jets
I. Axisymmetric Parameter Study and Analytic Approximation

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The propagation of extragalactic jets is studied by a series of twelve axisymmetric hydrodynamic simulations. Motivated by observational constraints, but unlike most previous simulations, the regime of jet to external medium density (η) from 10^{-5} to 10^{-2} is explored, for Mach numbers (M) between 2.6 and 26. The computational domain contained the bow shocks for the whole simulation time. The bow shocks are found to be spherical at source sizes below a critical value r_1 (blastwave phase), which can reach up to 10 jet radii. After that, their aspect ratio rises slowly, as long as the bow shock stays supersonic. The cocoons expand typically to almost the same size as the bow shock, unless the Mach number is below approximately three. Low values for the aspect ratio and the cocoon–to–bow–shock width ratio is demanded by recent Chandra X-ray observations of the bow shock in the archetypical radio galaxy Cygnus A. Therefore, $\eta < 10^{-3}$ and $M < 6$, in this source. The numerical work is complemented by an analytic approach for the spherical phase. Extending previous work, the radial force balance could be integrated for arbitrary background density and energy input, which results in a global solution. The analytic results are shown to be consistent with the numerical work, and a lower limit to r_1 can be calculated, which falls below the numerical results by a few jet radii. It is shown explicitely how a King density distribution changes the discussed aspects of the bow shock propagation. Because the jet head propagates very fast in the blastwave phase, it turns out that it is not possible to "frustrate" a jet by a high density environment. This is very important for the class of small radio galaxies (compact symmetric objects / GHz peaked sources): They have to be young. During its blastwave phase, a powerful jet can transfer typically 10^{60} erg to the environmental gas. This is enough to balance the radiative losses in a cooling flow, if one of the cluster galaxies harbours a powerful jet every 10^9 years.

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The Chandra Deep Field-North Survey. XIV. X-ray detected Obscured AGNs and Starburst Galaxies in the Bright Submm Source Population

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We provide X-ray constraints and perform the first X-ray spectral analyses for bright *SCUBA* sources ($f_{850\mu\mathrm{m}} \geq 5$ mJy; S/N$\geq$ 4) in an 8.4 arcmin by 8.4 arcmin area of the 2 Ms *Chandra* Deep Field-North survey containing the Hubble Deep Field-North. X-ray emission is detected from seven of the ten bright submm sources in this region down to 0.5–8.0 keV fluxes of $\approx 1 \times 10^{-16}$ erg cm^{-2} s^{-1}, corresponding to an X-ray detected submm source density of 360^{+190}_{-130} deg^{-2}; our analyses suggest that this equates to an X-ray detected fraction of the bright submm source population of $> 36\%$, although systematic effects may be present. Two of the X-ray detected sources have nearby (within 3 arcsec) X-ray c ompanions, suggesting merging/interacting sources or gravitational lensing effects, and three of the X-ray detected sources lie within the approximate extent of the proto-cluster candidate CXOHDFN J123620.0+621554. Five of the X-ray detected source s have flat effective X-ray spectral slopes ($\Gamma < 1.0$), suggesting obscured AGN activity. X-ray spectral analyses suggest that one of these AGNs may be a Compton-thick source; of the other four AGNs, three appear to be Compton-thin sources and one has poor constraints. The rest-frame unabsorbed X-ray luminosities of these AGNs are more consistent with those of Seyfert galaxies than QSOs (i.e., $L_X \approx 10^{43}$–10^{44} erg s^{-1}). Thus, the low X-ray detection rate of bright submm sour ces by moderately deep X-ray surveys appears to be due to the relatively low luminosities of the AGNs in these sources rather than Compton-thick absorption. A comparison of these sources to the well-studied heavily obscured AGN NGC 6240 shows that the ave rage AGN contribution is negligible at submm wavelengths. The X-ray properties of the other two X-ray detected sources are consistent with those expected from luminous star formation; however, we cannot rule out the possibility that low-luminosity AGNs ar e present. The three X-ray undetected sources appear to lie at high redshift ($z > 4$) and could be either AGNs or starbust galaxies.

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preprint available from http://arXiv.org/ (astro-ph/0211267)

Elemental Abundances in the Broad Emission Line Region of Quasars at Redshifts larger than 4

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We present observations of 11 high redshift quasars ($3.9 \lesssim z \lesssim 5.0$) observed with low spectral resolution in the restframe ultraviolet using FORS 1 at the VLT UT 1. The emission-line fluxes of strong permitted and intercombination ultraviolet emission lines are measured to estimate the chemical composition of the line emitting gas. Comparisons to photoionization calculations indicate gas metallicities in the broad emission line region in the range of solar to several times solar. The average of the mean metallicity of each high-z quasar in this sample is $Z/Z_{\odot} = 4.3 \pm 0.3$. Assuming a chemical evolution time scale of $\tau_{evol} \simeq 0.5 - 0.8$ Gyrs, we derive a redshift of $z_f \simeq 6$ to 8 for the onset of the first major star formation episode ($H_o = 65$ km s^{-1} Mpc^{-1}, $\Omega_M = 0.3$, $\Omega_\Lambda = 0.7$), corresponding to an age of the universe of several 10^8 yrs at this epoch. We note that this epoch is also supposed to be the era of re-ionization of the universe.

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The AGN Paradigm: Radio-Quiet Objects

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The current paradigm for radio-quiet AGNs is reviewed, taking into account new results from recent large-scale surveys carried out from the ground and from space. Topics include structure of the central engine, AGN demography, fueling/triggering processes, and connection between the supermassive black hole, host galaxy, circumnuclear starburst and AGN. Dependences on AGN power and lookback time are pointed out in the discussion. Suggestions for future avenues of research are mentioned in the last section.

Invited introductory review presented at the Meudon conference on "Active Galactic Nuclei: from Central Engine to Host Galaxy"

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XMM-Newton observation of PG 0844 + 349

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In a $\sim$ 20 ksec XMM-Newton observation the X-ray transient radio-quiet quasar PG 0844 + 349 was found in a historically high state compared to previous X-ray observations. The quasar showed a featureless spectrum with a strong soft excess over the extrapolation of a hard power law. Comptonization models or a broken power law with $\Gamma_{\rm soft} \sim 2.75$, $\Gamma_{\rm hard} \sim 2.25$ and a break energy of $E_{\rm break} \sim 1.35$ keV represent acceptable descriptions of the spectral continuum. In the Comptonization models the temperature of the Comptonizing gas is considerably lower than generally found in (broad line) Seyfert galaxies whereas the optical depth is much higher. As a similar behavior has been seen in NLSy1 galaxies, it might be an indicator of the different physical conditions in these two classes of AGN. During the XMM-Newton observation the flux of PG 0844 + 349 varied achromatically in a smooth, nearly linear fashion, by $\sim 25\%$ on time scales of a few thousand seconds, which puts some constraints on current models of Comptonizing accretion disk coronae.

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The Chandra Deep Field-North Survey. XVI. The X-ray properties of moderate-luminosity Active Galaxies at $z > 4$

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We present X-ray spectral analyses of the three $z > 4$ Active Galactic Nuclei (AGNs) thus far spectroscopically identified in the *Chandra* Deep Field-North Survey, at redshifts of 5.186, 4.424, and 4.137. These analyses are made possible by the extremely deep exposure (≈ 2 Ms) and the low *Chandra* background. We present X-ray spectral analyses of the three $z > 4$ Active Galactic Nuclei (AGNs) thus far spectroscopically identified in the *Chandra* Deep Field-North Survey, at redshifts of 5.186, 4.424, and 4.137. These analyses are made possible by the extremely deep exposure (≈ 2 Ms) and the low *Chandra* background.

The rest-frame ≈ 2.5–40 keV spectra are the first for optically faint (two of the three sources have $I > 24$) $z > 4$ AGNs. The $z = 5.186$ quasar is well fitted by a power-law model with photon index $\Gamma = 1.8 \pm 0.3$, consistent with those of lower-redshift, unobscured AGNs. The other two AGNs have flatter effective X-ray photon indices ($\Gamma \approx 1.1$–1.5), suggesting the presence of intrinsic absorption (provided their underlying X-ray continua are similar to those of lower-redshift AGNs). It is possible that the flat X-ray continuum of the $z = 4.424$ AGN is partially related to its radio loudness. If the $z = 4.137$ AGN suffers from X-ray absorption, the implied column density is $N_{\rm H} \approx 2 \times 10^{23}$ cm^{-2}. ≈ 2.5–40 keV spectra are the first for optically faint (two of the three sources have $I > 24$) $z > 4$ AGNs. The $z = 5.186$ quasar is well fitted by a power-law model with photon index $\Gamma = 1.8 \pm 0.3$, consistent with those of lower-redshift, unobscured AGNs. The other two AGNs have flatter effective X-ray photon indices ($\Gamma \approx 1.1$–1.5), suggesting the presence of intrinsic absorption (provided their underlying X-ray continua are similar to those of lower-redshift AGNs). It is possible that the flat X-ray continuum of the $z = 4.424$ AGN is partially related to its radio loudness. If the $z = 4.137$ AGN suffers from X-ray absorption, the implied column density is $N_{\rm H} \approx 2 \times 10^{23}$ cm^{-2}.

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X-ray Emission from Radio-Quiet Quasars in the SDSS Early Data Release. The $\alpha_{\rm ox}$ Dependence upon UV Luminosity

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We investigate the X-ray properties of the color-selected radio-quiet quasars (RQQs) in the Sloan Digital Sky Survey (SDSS) Early Data Release using *ROSAT*, *Chandra*, and XMM-*Newton* data. In the 0.16–6.28 redshift range, 136 RQQs have X-ray detections (69 from the *ROSAT* All-Sky Survey, RASS), while for 70 RQQs X-ray upper limits are obtained.

The well-defined selection method utilized by the SDSS, coupled with the tight radio constraints from the FIRST/NVSS surveys, allow us to define a representative sample of optically selected RQQs whose broad-band spectral energy distributions (characterized by means of the optical-to-X-ray spectral index, $\alpha_{\rm ox}$) can be studied as a function of rest-frame ultraviolet (UV) luminosity and redshift.

A partial correlation analysis applied to the SDSS sample (including the upper limits, but excluding the biased subsample of RASS detections) shows that $\alpha_{\rm ox}$ is a function of rest-frame UV luminosity (i.e., $\alpha_{\rm ox}$ steepens at high UV luminosities); this correlation is significant at the 3.7σ level.

We do not detect a highly significant redshift dependence of $\alpha_{\rm ox}$.

We also find a significant (7.8σ level) correlation between UV and X-ray luminosity. This correlation, parameterized by $L_{\rm X} \propto L_{\rm UV}^{0.75\pm0.06}$, extends previous results to the highest redshifts.

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preprint and Table 2 in electronic format available at http://www.astro.psu.edu/niel/papers/papers.html

Black Hole Masses in Three Seyfert Galaxies

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We analyze published reverberation mapping data for three Seyfert galaxies (NGC 3227, NGC 3516, and NGC 4593) to refine the mass estimate for the supermassive black hole in the center of each object. Treatment of the data in a manner more consistent with other large compilations of such masses allows us to more securely compare our results to wider samples of data, e.g., in the investigation of the M_{bh}-σ_* relationship for active and quiescent galaxies.

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On the nature of high luminosity ULIRGs

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We present the preliminary results for a sample of 21 high luminosity ULIRGs ($L_{IR} > 10^{12.3}$ L$\odot$), selected from the 1Jy sample. Based on R band imaging we have performed an analysis of their morphologies. The main results obtained is that about half of the host galaxies are represented by spheroids and in the other half an exponential disk has been detected or they show still trace of a merging process going on. Regarding the relation between morphology and nuclear activity it seems that more advanced mergers appear in the most active galaxies. Hence the data support the evolutionary scheme proposed by Sanders 15 years ago that ULIRGs can be the earliest precursors of optical QSOs.

Euroconference in Kiel, in press, Eds. G. Hensler et al., Kluwer

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Rotation curves and metallicities of active and non-active spiral galaxies

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The shapes and properties of the rotation curves (RC) together with thee line ratios, used to estimate the metallicity of all the detected HII regions, have been derived from long slit spectra in the Hα emission line region for a sample of isolated active and non-active spiral galaxies. No difference is apparent between active and non-active galaxies. Both samples of galaxies have disk metallicities similar to those of interacting galaxies, and RC properties similar to those of isolated early type spirals.

Conference "ACTIVE GALACTIC NUCLEI:FROM CENTRAL ENGINE TO HOST GALAXY", Meudon, 2002, Eds. Combes et al., in press

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The Active Galaxies Newsletter is available on the World Wide Web. You can access it via the University of Manchester home page :- http://www.ast.man.ac.uk/~rb/agn/
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