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.

Rob Beswick

Abstracts of recently accepted papers

Mid-IR galaxy classification based on silicate obscuration and PAH equivalent width

H.W.W. Spoon[1,2], J.A. Marshall[1], J.R. Houck[1], M. Elitzur[3], L. Hao[1], L. Armus[4], B.R. Brandl[5], V. Charmandaris[6,7,8]

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We present a new diagnostic diagram for mid-infrared spectra of infrared galaxies based on the equivalent width of the 6.2 micron PAH emission feature and the strength of the 9.7 micron silicate feature. Based on the position in this diagram we classify galaxies into 9 classes ranging from continuum-dominated AGN hot dust spectra and PAH-dominated starburst spectra to absorption-dominated spectra of deeply obscured galactic nuclei. We find that galaxies are systematically distributed along two distinct branches: one of AGN and starburst-dominated spectra and one of deeply obscured nuclei and starburst-dominated spectra. The separation into two branches likely reflects a fundamental difference in the dust geometry in the two sets of sources: clumpy versus non-clumpy obscuration. Spectra of ULIRGs are found along the full length of both branches, reflecting the diverse nature of the ULIRG family.

5 pages, 3 figures. Accepted for publication in ApJ Letters

E-mail contact: spoon@astro.cornell.edu, preprint available at http://arxiv.org/abs/astro-ph/0611918

Uncertainties of the masses of black holes and Eddington ratios in AGN

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Black hole masses in Active Galactic Nuclei have been determined in 35 objects through reverberation mapping of the emission line region. I mention some uncertainties of the method, such as the "scale factor" relating the Virial Product to the mass, which depends on the unknown structure and dynamics of the Broad Line Region.

When the black hole masses are estimated indirectly using the empirical size-luminosity relation deduced from this method, the uncertainties can be larger, especially when the relation is extrapolated to high and low masses and/or luminosities. In particular they lead to Eddington ratios of the order of unity in samples of Narrow Line Seyfert 1. As the optical-UV luminosity is provided by the accretion disk, the accretion rates can be determined and are found to be much larger than the Eddington rates.

So, accretion must be performed at a super-critical rate through a slim disk, resulting in rapid growth of the black holes. The alternative is that the mass determination is wrong at this limit.

To appear in the proceedings of "Black Holes: from Stars to Galaxies", IAU Symp. No. 238, V. Karas & G. Matt (eds.), Cambridge University Press

Thermal instability in X-ray photoionized media in Active Galactic Nuclei: Influence on the gas structure and spectral features

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A photoionized gas in thermal equilibrium can display a thermal instability, with three or more solutions in the multi-branch region of the S-shape curve giving the temperature versus the radiation-to-gas-pressure ratio. Many studies have been devoted to this curve and to its dependence on different parameters, always in the optically thin case. The purpose of our study is the thermal instability in optically thick, stratified media, in total pressure equilibrium. We are also interested in comparing photoionization models issued from the hot and cold stable solutions, with the currently used models computed with an approximate, intermediate solution. We have developped a new algorithm to select the hot/cold stable solution, and thereof to compute a fully consistent photoionization model. We have implemented it in the TITAN code and computed a set of models encompassing the range of conditions valid for the Warm Absorber in Active Galactic Nuclei.

We have demonstrated that the thermal instability problem is quite different in thin or thick media. Models computed with the hot/cold stable solutions, or with an intermediate solution, differ all along the gas slab, with the spectral distribution changing as the radiation progresses inside the ionized gas. These effects depend on the thickess of the medium and on its ionization. This has observational implications in the emitted/absorbed spectra, ionization states, and variability. However impossible to know what solution the plasma will adopt when attaining the multi-solutions regime, we expect the emitted/absorbed spectrum to be intermediate between those resulting from pure cold and hot models; such a phase-mixed medium can be well reproduced by intermediate solution models. Large spectral fluctuations corresponding to the onset of a cold/hot solution could be observed in timescales of the order of the dynamical time. A strong turbulence implying supersonic velocities should permanently exist in the multi-branch region of thick, stratified, pressure equilibrium media.

Accepted by Astronomy & Astrophysics

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preprint available at http://xxx.lanl.gov/abs/astro-ph/0612035

Multi-frequency monitoring of γ-ray loud blazars: I. Light curves and spectral energy distributions

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Context: Being dominated by non-thermal emission from aligned relativistic jets, blazars allow us to elucidate the physics of extragalactic jets, and, ultimately, how the energy is extracted from the central black hole in radio-loud active galactic nuclei. *Aims:* Crucial information is provided by broad-band spectral energy distributions (SEDs), their trends with luminosity and correlated multi-frequency variability. With this study we plan to obtain a database of contemporaneous radio-to-optical spectra of a sample of blazars, which are and will be observed by current and future high-energy satellites. *Methods:* Since December 2004 we are performing a monthly multi-frequency radio monitoring of a sample of 35 blazars at the antennas in Medicina and Noto. Contemporaneous near-IR and optical observations for all our observing epochs are organised. *Results:* Until June 2006 about 4000 radio measurements and 5500 near-IR and optical measurements were obtained. Most of the sources show significant variability in all observing bands. Here we present the multi-frequency data acquired during the first eighteen months of the project, and construct the SEDs for the best-sampled sources.

Accepted by A&A

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preprint available at http://arxiv.org/abs/astro-ph/0612149

Optical Monitoring of BL Lacertae Object S5 0716+714 with a Novel Multi-Peak Interference Filter

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We at first introduce a novel photometric system, which consists of a Schmidt telescope, an objective prism, a CCD camera, and, especially, a multi-peak interference filter. The multi-peak interference filter enables light in multi passbands to pass through it simultaneously. The light in different passbands is differentially refracted by the objective prism and is focused on the CCD separately, so we have multi "images" for each object on the CCD frames. This system enables us to monitor blazars *exactly* simultaneously in multi wavebands on a single telescope, and to accurately trace the color change during the variation. We used this novel system to monitor the BL Lacertae object S5 0716+714 during 2006 January and February and achieved a very high temporal resolution. The object was very bright and very active during this period. Two strong flares were observed, with variation amplitudes of about 0.8 and 0.6 mags in the V' band, respectively. Strong bluer-when-brighter correlations were found for both internight and intranight variations. No apparent time lag was observed between the V'- and R'-band variations, and the observed bluer-when-brighter chromatism may be mainly attributed to the larger variation amplitude at shorter wavelength. In addition to the bluer-when-brighter trend, the object also showed a bluer color when it was more active. The observed variability and its color behaviors are consistent with the shock-in-jet model.

Accepted by Astron. J.

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preprint available at http://arxiv.org/abs/astro-ph/0612142

The X-ray Evolution of Early-Type Galaxies in the Extended *Chandra* Deep Field-South

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We investigate the evolution over the last 6.3 Gyr of cosmic time (i.e., since $z \approx 0.7$) of the average X-ray properties of early-type galaxies within the Extended *Chandra* Deep Field-South (E-CDF-S). Our early-type galaxy sample includes 539 objects with red-sequence colors and Sérsic indices larger than $n = 2.5$, which were selected jointly from the COMBO-17 (Classifying Objects by Medium-Band Observations in 17 Filters) and GEMS (Galaxy Evolution from Morphologies and SEDs) surveys. We utilize the deep *Chandra* observations over the E-CDF-S and X-ray stacking analyses to constrain primarily the average X-ray emission from "normal" early-type galaxies (i.e., those that are not dominated by luminous active galactic nuclei [AGNs]). In our analyses, we study separately optically luminous ($L_B \approx 10^{10-11}$ $L_{B,\odot}$) and faint ($L_B \approx 10^{9.3-10}$ $L_{B,\odot}$) galaxy samples, which we expect to have soft (0.5–2.0 keV) X-ray emission dominated by hot ($\sim$1 keV) interstellar gas and low mass X-ray binary (LMXB) populations, respectively. We detect individually 49 ($\approx$9%) of our galaxies in the X-ray band, and classify these sources as either normal early-type galaxies (17 galaxies) or AGN candidates (32 galaxies). The AGN fraction of our optically luminous samples evolves with redshift in a manner consistent with the $(1 + z)^3$ evolution observed in other investigations of X-ray-selected AGNs. After removing potential AGNs from our samples, we find that the X-ray–to–B-band mean luminosity ratio (L_X/L_B) foroptically luminous early-type galaxies does not evolve significantly over the redshift range $z \approx 0.0$–0.7. This lack of X-ray evolution implies a general balance between the heating and cooling of the hot interstellar gas. If transient AGN activity is largely responsible for maintaining this balance, then we infer that mechanical power must be dominating the feedback out to $z \approx 0.7$. Furthermore, in this scenario the average mechanical AGN power must remain roughly constant over the last half of cosmic time despite significant evolution in the average AGN radiative luminosity. For our optically faint early-type galaxies, we find suggestive evidence that L_X/L_B increases with redshift over the range $z \approx 0.0$–0.5; however, due to limited statistical constraints on both the local L_X/L_B ratio and the AGN contamination of our samples, we consider this result to be marginal.

Accepted by the Astrophysical Journal

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preprint available at http://xxx.lanl.gov/abs/astro-ph/0612003

Starburst Galaxies

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Star-formation and the Starburst phenomenon are presented with respect to a number of nearby star-forming galaxies where our understanding of the process can be calibrated. Methods of estimating star-formation rates are discussed together with the role played in the investigation of the process by multi-wavelength studies of a few selected starburst galaxies (especially the well studied galaxy M82). Our understanding of nearby systems allows us to study the star-formation history of the Universe by observing high-redshift starburst galaxies. These begin to dominate the radio source populations at centimetric wavelengths at flux densities below a few 10s of μJy. New very sensitive, high resolution telescopes in the sub-mm and radio will revolutionize our understanding of these distant star-forming systems, some of which may contain embedded AGN.

To appear in the proceedings of 'The 8th European VLBI Network Symposium on New Developments in VLBI Science and Technology', ed. A. Marecki et al., held in Torun, Poland, on September 26-29, 2006 (Invited Review)

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preprint available at http://arxiv.org/abs/astro-ph/0611951

Mass Outflow from the Nucleus of the Seyfert 1 Galaxy NGC 4151[1]

D.M. Crenshaw[2] & S.B. Kraemer[3,4]

[1]Based on observations made with the NASA/ESA Hubble Space Telescope, obtained from the Data Archive at the Space Telescope Science Institute, which is operated by the Association of Universities for Research in Astronomy, Inc., under NASA contract NAS 5-26555.
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We present an analysis of UV and optical spectra of NGC 4151 obtained at high spectral and angular resolutions with the *Hubble Space Telescope's* (*HST's)* Space Telescope Imaging Spectrograph (STIS). We identify a kinematic component of the emission lines that has a width of 1170 km s^{-1} (FWHM), intermediate between those from the broad and narrow (emission) line regions (BLR and NLR). We present evidence that these emission lines arise from the same gas responsible for most of the high-column UV and X-ray absorption (component "D+E") that we see in outflow at a distance of $\sim$0.1 pc from the central nucleus. The gas in this intermediate-line region (ILR) shields the NLR and has a global covering factor of $\sim$0.4, based on the observed C IV fluxes, indicating mass outflow over a large solid angle centered on the accretion disk's axis. A large transverse velocity ($v_T \geq 2100$ km s^{-1}) compared to the radial velocity centroid ($v_r = -490$ km s^{-1}) indicates that the kinematics is dominated by rotation at this distance, but has a significant outflow component. The mass outflow rate at 0.1 pc is $\sim$0.16 $M_\odot$ yr^{-1}, which is about 10 times the accretion rate. Based on physical conditions in the gas and dynamical considerations, models that invoke magnetocentrifugal acceleration (e.g., in an accretion-disk wind) are favored over those that rely on radiation driving or thermal expansion as the principal driving mechanism for the mass outflow.

Accepted by The Astrophysical Journal, http://arxiv.org/abs/astro-ph/0612446

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The Origin of Wavelength-Dependent Continuum Delays in AGNs – a New Model

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A model of wavelength-dependent lags in optical continuum variability of AGNs is proposed which avoids the problems of the popular "lamp-post" model. Rather than being due to reprocessing of high-energy radiation from a hypothetical source above the accretion disk, the wavelength-dependent delays observed from the B to I bands are instead due to contamination of an intrinsically coherently variable continuum with the Wien tail of the thermal emission from the hot dust in the surrounding torus. The new model correctly gives the size, wavelength dependence, and luminosity dependence of the lags, and quantitatively predicts observed color hysteresis. The model also explains how the measured delays vary with epoch of observation. There must also be contamination by scattered light and this can be detected by a lag in the polarized flux.

To appear in "The Central Engine of Active Galactic Nuclei", ed. L. C. Ho and J.-M. Wang (San Francisco: Astronomical Society of the Pacific)

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preprint: http://arxiv.org/abs/astro-ph/0612474

An XMM-Newton view of the X-ray flat radio-quiet quasar PG 1416−129

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The radio-quiet quasar PG 1416−129 ($z = 0.129$) exhibits atypical optical and X-ray properties. Between 1990 and 2000, in response to its optical continuum decrease, the "classical" broad component of Hβ almost completely disappeared, with a factor of 10 decrease in the line flux. In addition, the width of the broad component of the Hβ line decreased significantly from 4000

km s^{-1} to 1450 km s^{-1}. In the X-ray band, this object was observed by Ginga in 1988 to have the hardest quasar photon index, with Γ=1.1$\pm$0.1. We present an *XMM-Newton*/EPIC observation of PG 1416$-$129 performed in July 2004. We analyze the time-averaged pn spectrum of this quasar, as well as perform time-resolved spectroscopy. We find that during the present XMM-Newton observation, PG 1416$-$129 still has a rather hard photon index, both in the soft (0.2–2 keV) and hard (2–12 keV) energy ranges, compared to radio-quiet quasars (BLS1 and NLS1) but compatible with the photon index value found for radio-loud quasars. This object also shows long-term luminosity variability over 16 years by a factor of three with a variation of photon index from $\sim$1.2 to $\sim$ 1.8. In the soft energy band (0.2–2 keV), we found a very weak soft X-ray excess compared to other RQ quasars. The whole time averaged spectrum is fit very well either by X-ray ionized reflection from the accretion disk surface, by a warm absorber-emitter plus power-law, or by a smeared absorption/emission from a relativistic outflow. While no constant narrow Fe K line at 6.4 keV is observed, we find the possible presence of two non-simultaneous transient iron lines: a redshifted narrow iron line at about 5.5 keV (96.4% confidence level according to multi-trial Monte-Carlo simulations) at the beginning of this observation and the appearance of a line at 6.3–6.4 keV (99.1% c.l.) at the end of the observation. These variable lines could be generated by discrete hot-spots on the accretion disk surface.

Accepted by Astronomy & Astrophysics

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preprint available at astro-ph/0612485

Balmer Absorption Lines in FeLoBALs

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We discovered non-stellar Balmer absorption lines in two many-narrow-trough FeLoBALs (mntBALs) by the near-infrared spectroscopy with Subaru/CISCO. Presence of the non-stellar Balmer absorption lines is known to date only in the Seyfert galaxy NGC 4151, thus our discovery is the first cases for quasars. Since all known active galactic nuclei with Balmer absorption lines share characteristics, it is suggested that there is a population of BAL quasars which have unique structures at their nuclei or unique evolutionary phase.

Conference proceedings to appear in "The Central Engine of Active Galactic Nuclei", ed. L. C. Ho and J.-M. Wang (San Francisco: ASP)

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Spitzer Observations of 3C Quasars and Radio Galaxies: Mid-Infrared Properties of Powerful Radio Sources

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We have measured mid-infrared radiation from an orientation-unbiased sample of 3CRR galaxies and quasars at redshifts $0.4 \leq z \leq 1.2$ with the IRS and MIPS instruments on the *Spitzer Space Telescope*. Powerful emission ($L_{24\mu\mathrm{m}} > 10^{22.4}$ W Hz^{-1} sr^{-1}) was detected from all but one of the sources. We fit the *Spitzer* data as well as other measurements from the literature with synchrotron and dust components. The IRS data provide powerful constraints on the fits. At 15 μm, quasars are typically four times brighter than radio galaxies with the same isotropic radio power. Based on our fits, half of this difference can be attributed to the presence of non-thermal emission in the quasars but not the radio galaxies. The other half is consistent with dust absorption in the radio galaxies but not the quasars. Fitted optical depths are anti-correlated with core dominance, from which we infer an equatorial distribution of dust around the central engine. The median optical depth at 9.7 μm for objects with core-dominance factor R $> 10^{-2}$ is ≈ 0.4; for objects with R $\leq 10^{-2}$, it is ≈ 1.1. We have thus addressed a long-standing question in the unification of FR II quasars and galaxies: quasars are more luminous in the mid-infrared than galaxies because of a combination of Doppler-boosted synchrotron emission in quasars and extinction in galaxies, both orientation-dependent effects.

Accepted by ApJ.

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preprint available at http://arxiv.org/abs/astro-ph/0612702

Meetings

Second Announcement:
The Nuclear Region, Host Galaxy and Environment of Active Galaxies:
A Symposium to celebrate the 60th birthday of Deborah Dultzin-Hacyan
Huatulco, Mexico
April 18 to 20, 2007

Webpage: http://www.astroscu.unam.mx/congresos/agn2007/

Dear Colleagues:

This is the SECOND announcement of the Symposium: "The Nuclear Region, Host Galaxy and Environment of Active Galaxies: A Symposium to celebrate the 60th birthday of Deborah Dultzin-Hacyan" organized by the Instituto de Astronomia (UNAM), to be held on April 18 to 20, 2007 in Huatulco, Mexico. The Symposium will cover topics ranging from the nearest environment of the black hole, to the environment of the host galaxies of AGN.

SOC: Virginia Trimble (USA), Iraida Pronik (Crimea), Chatherine Boisson (France), Elena Terlevich (UK, Mexico), Josefa Masegosa (Spain), Irene Cruz-Gonzalez (Mexico), Elena Pian (Italy), Sueli Viegas (Brazil), Dawei Xu (China), Erika Benitez (chair, Mexico)

Venue:
The venue of the meeting will be the Hotel Gala Beach Resort. The Hotel is located in Huatulco, a beautiful beach town at the Pacific Ocean. We have made arrangements with the Hotel Gala in order to have special fares for people registered before February 9th, 2007.

For further information please visit the WEB-page: http://www.astroscu.unam.mx/congresos/agn2007/.

Visa:
The organizers recommend all participants to check the VISA-agreement between Mexico and the respective country of origin. In some cases it is necessary to prepare documents 3 months in advance. For more information you can visit: http://www.astroscu.unam.mx/congresos/agn2007/visa.html

Abstract Submission:
Colleagues interested in contributing to the Symposium are asked to register and submit an abstract summarizing their research. The Scientific Committee will select the participants among all abstracts received, and will choose the abstracts to be presented in oral or poster sessions.

IMPORTANT: The deadline for abstract submission is January 5th 2007.

All registration material should be submitted before the abstract deadline, so the organizers can make prompt decisions concerning acceptance of abstracts.

Invited Talks (confirmed):

- Suzy Collin—Historical Review
- Luc Binette—Dust in Quasars: how it may affect the UV energy distribution?
- Jack Sulentic—Our Search for an HR Diagram of Quasars
- Vahe Petrosian—Plasma around Black Holes
- Megan Urry—Theoretical Review
- Esko Valtaoja—Blazars Review
- Thaisa Storchi-Bergmann—Observational Review
- Martin Gaskell—What Variability of Non-Blazar AGNs is Telling Us
- Isabel Marquez—Feedback between Host Galaxy and Nuclear Activity
- Paola Marziani—BLR in Quasars
- Manolis Plionis—Active Galaxies's Environment
- Steffanie Komossa—NLS1 Galaxies

- Roberto Cid-Fernandez—Circumnuclear Starbursts

Please forward this announcement to your colleagues.

Best regards,

Dr. Erika Benitez