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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

Proto-Quasars: Physical States and Observable Properties

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Based on the radiation hydrodynamical model for the black hole (BH) growth, incorporated with the chemical evolution of the early-type host galaxy, we construct the coevolution model of a QSO BH and the host galaxy. As a result, it is found that after a galactic wind epoch, the luminosity is shifted from the host-dominant phase to the AGN-dominant phase (QSO phase) in the timescale of a few 10^8 years. The former phase corresponds to the early stage of growing BH, and can be regarded as a "proto-QSO" phase. It has observable characteristic properties as follows: (1) The width of broad emission line is narrower than that of ordinary QSOs, and it is typically less than 1500km/s. (2) The BH-to-bulge mass ratio, $M_{\rm BH}/M_{\rm bulge}$, is in the range of $10^{-5.3} - 10^{-3.9}$. (3) Host galaxies are bluer compared to QSO hosts, by about 0.5 magnitude in the colors of $(B-V)$ at the rest bands and $(V-K)$ at the observed bands, with assuming galaxy formation redshifts of $z_{\rm f} = 3-5$. (4) The metallicity of gas in galactic nuclei is $\sim 8Z_\odot$, and that of stars weighted by the host luminosity is $\sim 3Z_\odot$. (5) The central massive BH ($\simeq 10^7 M_\odot$) is surrounded by a massive dusty disk ($> 10^8 M_\odot$), which may obscure the nucleus in the edge-on view and make a type 2 nucleus. By comparing these predictions with recent observations, radio galaxies are a possible candidate for proto-QSOs. Also, it is anticipated that the proto-QSO phase is preceded by an optically thick phase, which may correspond to ULIRGs. In this phase, $M_{\rm BH}/M_{\rm bulge}$ is predicted to be much less than 10^{-3} and grow with metallicity. Moreover, as precursors of ULIRGs, optically-thin star-forming galaxies are predicted. These may be in the assembly phase of Lyman break galaxies (LBGs) or Lyα emitters.

Accepted by ApJ

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preprint available at http://arxiv.org/abs/astro-ph/0209452

X-ray lighthouses of the high-redshift Universe. Probing the most luminous $z > 4$ Palomar Digital Sky Survey quasars with Chandra

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We present the results from exploratory *Chandra* observations of nine high-redshift (z=4.09–4.51) optically selected quasars. These quasars, taken from the Palomar Digital Sky Survey (DPOSS), are among the optically brightest and most luminous $z > 4$ quasars known ($M_{\rm B}\approx-28.4$ to -30.2). All have been detected by *Chandra* in exposure times of $\approx$ 5–6 ks, tripling the number of highly luminous quasars ($M_{\rm B} < -28.4$) with X-ray detections at $z > 4$. These quasars' average broad-band spectral energy distributions are characterized by steeper (more negative) $\alpha_{\rm ox}$ values ($\langle\alpha_{\rm ox}\rangle=-1.81\pm0.03$) than those of lower-luminosity, lower-redshift samples of quasars. We confirm the presence of a significant correlation between the ultraviolet magnitude and soft X-ray flux previously found for $z > 4$ quasars. The joint $\approx$ 2–30 keV rest-frame X-ray spectrum of the nine quasars is well parameterized by a simple power-law model whose photon index, $\Gamma \approx 2.0\pm0.2$, is consistent with those of lower-redshift quasars. No evidence for significant amounts of intrinsic absorption has been found ($N_{\rm H} \leq 8.8\times10^{21}$ cm^{-2} at 90% confidence). In general, our results show that $z \approx$ 4.1–4.5 quasars and local quasars have reasonably similar X-ray and broad-band spectra (once luminosity effects are taken into account), suggesting that the accretion mechanisms in these objects are similar. We also present near-simultaneous optical spectra for these quasars obtained with the Hobby-Eberly Telescope; this is the first time optical spectra have been published for seven of these objects. The objects presented in this paper are among the best $z > 4$ targets for X-ray spectroscopy with *XMM*-Newton and next-generation large-area X-ray telescopes. These will detect or constrain iron Kα emission lines down to rest-frame equivalent widths of $\approx$ 50 eV and intrinsic column densities down to $N_{\rm H} \approx$ a few $\times10^{21}$ cm^{-2} at $z \approx 4$. We also present 45 new *ROSAT* upper limits for $z \geq 4$ quasars and a likely (3σ) HRI detection of the blazar GB 1713+2148 at $z = 4.01$.

Accepted by Astron. J. (Feb. 2003), astro-ph/0210475

E-mail contact: chris@astro.psu.edu,
preprint, list of $z \geq 4$ X-ray detected AGNs, and Hobby-Eberly Telescope optical spectra available at
http://www.astro.psu.edu/~niel/papers/papers.html

COLA II - Radio and Spectroscopic Diagnostics of Nuclear Activity in Galaxies

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We present optical spectroscopic observations of 93 galaxies taken from the infra-red selected COLA (Compact Objects in Low Power AGN) sample. These are all galaxies for which we have previously obtained low resolution radio observations and high resolution ($< 0.05''$) Long Baseline Array (LBA) snapshots. The sample spans the range of far-IR luminosities from normal galaxies to LIRGs, and contains a significant number of galaxies involved in galaxy-galaxy interactions. Of the galaxies observed, 78 (84%) exhibit emission lines indicating that they are either AGN or actively forming stars (starburst galaxies). Using a newly-developed theoretically-based optical emission-line scheme to classify the spectra, we find 15% of the emission-line galaxies are Seyferts, 77% are starbursts, and the rest are either borderline AGN/starburst or show ambiguous characteristics. We find little evidence for an increase in the fraction of AGN in the sample as a function of far-IR luminosity, in contrast to previous studies, but our sample covers only a small range in infrared luminosity ($10.5 \leq L_{FIR} \leq 11.7$) and thus a weak trend may be masked. Instead, as the infrared luminosity increases so does the fraction of metal-rich starbursts; objects which on more traditional diagnostic diagrams would have been classified as weak LINERs (Low Ionization Narrow Emission Line Regions). As a whole the Seyfert galaxies exhibit a small, but statistically significant, radio excess on the radio-FIR correlation compared to the galaxies classified as starbursts. Compact (<0.05") radio cores are detected in 55% of the Seyfert galaxies, and these galaxies exhibit a significantly larger radio excess than the Seyfert galaxies in which compact cores were not detected. Our results indicate that there may be two distinct populations of Seyferts, "radio-excess" Seyferts, which exhibit extended radio structures and compact radio cores, and "radio-quiet" Seyferts, in which the majority of the radio emission can be attributed

to star-formation in the host galaxy. No significant difference is seen between the IR and optical spectroscopic properties of Seyferts with and without radio cores.

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preprint available at http://xxx.lanl.gov/abs/astro-ph/0210197

Quasar Tomography: Unification of Echo Mapping and Photoionisation Models

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Reverberation mapping aims to use time-delayed variations in photoionised emission lines to map the geometry and kinematics of emission-line gas in the vicinity of an active galactic nucleus. By fitting to a time-variable emission line profile, one can reconstruct a 2-dimensional map $\Psi(\tau, v)$, where τ is the time delay and v is the Doppler shift, for each emission line. In this paper we develop quasar tomography, which combines the time delay and velocity information with photoionisation physics in order to map the reprocessing region using information assembled from many different emission lines. The observed spectral variations are modelled in terms of direct light from the active nucleus and time-delayed reprocessed light from surrounding gas clouds. We use the photoionisation code CLOUDY to evaluate line and continuum reprocessing efficiencies $\epsilon(\lambda, \Phi_{\rm H}, n_{\rm H}, N_{\rm H}, \theta)$ for clouds of hydrogen density $n_{\rm H}$ and column density $N_{\rm H}$ exposed to hydrogen-ionising photon flux $\Phi_{\rm H}$. The gas distribution is described by a 5-dimensional map, the differential covering fraction $f(R, \theta, n_{\rm H}, N_{\rm H}, v)$, which we reconstruct from the 2-dimensional data $F_\lambda(\lambda, t)$ by using maximum entropy techniques. Tests with simulated data and a variety of geometries (shells, rings, disks, clouds, jets) are presented to illustrate some of the capabilities and limitations of the method. Specifically, we reconstruct 3-dimensional geometry-density maps, $f(R, \theta, n_{\rm H})$, by fitting to well-sampled light curves for the continuum and 7 ultraviolet emission lines. The maps are distorted in ways that we understand and discuss. The most successful test recovers a hollow shell geometry, determining correctly its radius and density. The data constrain the ionisation parameter $U \propto R^{-2} n_{\rm H}^{-1}$ to about 0.1 dex, the radius R to 0.15 dex, and $n_{\rm H}$ to 0.3 dex. We expect better constraints to arise from future fits using more lines and velocity profiles as well as velocity-integrated line fluxes. The maps are sensitive to the assumed distance, offering some prospects for using emission-line reverberations to measure the luminosities and distances of active galactic nuclei.

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E-mail contact: kdh1@st-and.ac.uk,
preprint available at astro-ph/0210539

Masses of Black Holes in Active Galactic Nuclei

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We present a progress report on a project whose goal is to improve both the precision and accuracy of reverberation-based black-hole masses. Reverberation masses appear to be accurate to a factor of about three, and the black-hole mass/bulge velocity dispersion ($M_{\rm BH} - \sigma$) relationship appears to be the same in active and quiescent galaxies.

To appear in Active Galactic Nuclei: from Central Engine to Host Galaxy, ed. S. Collin, F. Combes, and I. Shlosman

Available at http://xxx.lanl.gov/abs/astro-ph/0210639

SECOND ANNOUNCEMENT
Invitation to a Workshop in
The Neutral ISM in Starburst Galaxies

Gothenburg - Marstrand, Sweden
June 24-27, 2003

http://www.oso.chalmers.se/workshop (The site is now open for pre-registration)

Please note shift of dates from first announcement.

DEADLINES:
Please pre-register now on our website (see above). Please note that this is pre-registration only. The final registration for the conference will commence in mid-December 2002, and will be announced via email.

SCIENTIFIC BACKGROUND:
Recent development in mm and cm aperture synthesis, as well as submm single dish technology has led to a flood of new observations of the neutral ISM in nearby and distant starburst galaxies. Molecular and atomic hydrogen lines from many starburst galaxies can now be observed on arcsecond and even subarcsecond scales. This development enables new approaches to, and a deeper understanding of, the structure, dynamics and physical conditions of the nuclear ISM in UltraLuminous Galaxies (ULIRGs) and starbursts. The neutral ISM is particularly important in the inner regions of starbursts where it dominates the mass of the interstellar medium (and in some cases may even dominate the total central mass). Thus, observing and modelling the neutral ISM is essential for understanding the onset and evolution of the burst of starformation as well as its terminating mechanisms.

Specific issues to be addressed include:

- Recent developments in the modelling of structure and physical conditions of unresolved cloud ensembles. Fitting ISM models to observational data.
  - Mass distribution between diffuse (unbound) molecular gas and self-gravitating gas in compact and extended starbursts.
  - Mass distribution between atomic and molecular gas — the role and origin of the two phases. Mass and temperature distribution of the dust - is there evidence of cold dust?
- Limiting star formation rates in starbursts and ULIRGs — can we relate the properties of the ISM to starformation rates? Are the enormous IR fluxes in ULIRGs caused by extremely effective or unusual star formation? Are other processes than star formation significantly adding to the IR flux?
  - Observation and formation of massive star clusters
  - Starburst feedback and self-regulation
- The dynamics of the ISM and the rate of star formation - preventing or encouraging star formation?
  - The role of bars in enhancing star formation rates.
  - Shocks as triggers of star formation.
  - Holes/bubbles in the neutral gas - the footprints of earlier starformation?

The workshop will consist of review talks followed by 3-4 contributed talks (10-15 minutes each). For more information, contact:
Susanne Aalto, email: susanne@oso.chalmers.se, fax: +46-300-35590, phone: +46-300-35506.

Scientific Organizing Comittee:

S. Aalto, A. Pedlar, S. Huttemeister, P. Diamond, K. Wills, W. Baan, N. Scoville, T. Heckman, R. Booth, M. Ward

Local Organising Comittee:

S. Aalto, J. Conway, C. Horellou, C. Andersson

Intended number of participants: 50 - 60

Estimated conference fee: 220 Euros (after deadline: 300 Euros)

THE LOCATION:

Marstrand is a half-hour drive away from the center of Gothenburg, and a very popular vacation spot in the summer, attracting sailing-enthusiasts and visitors from all over the world. The workshop will be held at the old fortress, "Carlstens Faestning" with accomodation possible in the fortess itself, or in nearby hotels. The fortress is surrounded by the small town of Marstrand and a 2 minute ferry trip connects this island with the mainland where direct bus service to central Gothenburg is available. Popular activities in Marstrand include: sailing (of course), swimming, diving, fishing, kayaking, steamboat tours etc. For more information visit the workshop webpage - or try these sites:

http://www.marstrand.org/ (in Swedish - but with nice pictures and links)
http://www.marstrand.org/images/fotoalbum/images/marstrand_1.jpg (view of Marstrand with the Fortress in the background)
http://www.hotellnautic.com/ (information in English)

We plan to hold a second workshop in 2004 in Bochum, Germany. There will be more information on this later.

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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