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Accepted Abstracts - Submitted Abstracts - Thesis Abstracts
Jobs Adverts - Meetings Adverts - Special Announcements

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.

Rob Beswick

Abstracts of recently accepted papers

Are AGN the best factories for high energy particles and photons?

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The main properties of AGN are reviewed, focussing on the accretion process and on the question of whether AGN are the best factories of ultra high energy particles and photons. I recall the large differences between the accretion/ejection flows in strong and weak accretors, and I conclude that, since low luminosity AGN and even "dormant" massive black holes in nuclei of galaxies are powering strong confined magnetized jets able to accelerate high energy particles, and are present in a large proportion of galaxies, they might be better potential sources of high energy particles and photons than luminous AGN and powerful radio galaxies.

Review presented at the XXth Rencontres de Blois, to appear in Proceedings this meeting, J. Dumarchez and J. Tran Thanh Van editors, The Gioi Publishers

astroph 0811.1731, E-mail contact: suzy.collin@obspm.fr

Dynamical Evolution of AGN Host Galaxies - Gas In/Out-Flow Rates in 7 NUGA Galaxies

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To examine the role of the host galaxy structure in fueling nuclear activity, we estimated gas flow rates from several kpc down to the inner few 10 pc for seven nearby spiral galaxies, selected from the NUGA sample (NUclei of GAlaxies). We calculated gravitational torques from near-IR images and determined gas in/out-flow rates as a function of radius and location within the galactic disks, based on high angular resolution interferometric observations of molecular (CO using PdBI) and atomic (HI using the VLA) gas. The results are compared with kinematic evidence for radial gas flows and the dynamical state of the galaxies (via resonances) derived from several different methods. We show that gravitational torques are very efficient at transporting gas from the outer disk all the way into the galaxies centers at ~100 pc; previously assumed dynamical barriers to gas transport, such as the Corotation Resonance of stellar bars, seem to be overcome by gravitational torque induced gas flows from other non-axisymmmetric structures. The resulting rates of gas mass inflow range from 0.01 to 50 $M_\odot$ yr^{-1} and are larger for the galaxy center than for the outer disk. Our gas flow maps show the action of nested bars within larger bars for 3 galaxies. Non-circular streaming motions found in the kinematic maps are larger in the center than in the outer disk and appear to correlate only loosely with the in/out-flow rates as a function of radius. We demonstrate that spiral gas disks are very dynamic systems that undergo strong radial evolution on timescales of a few rotation periods (e.g. $5 \cdot 10^8$ yrs at a radius of 5 kpc), due to the effectiveness of gravitational torques in redistributing the cold galactic gas.

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preprint available at http://arxiv.org/abs/0811.1988 or http://www.mpia.de/homes/haan/research.html

CAIXA: a Catalogue of AGN In the XMM-*Newton* Archive I. Spectral analysis

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We present CAIXA, a Catalogue of AGN In the XMM-*Newton* Archive. It consists of all the radio-quiet X-ray unobscured ($N_H < 2 \times 10^{22}$ cm^{-2}) Active Galactic Nuclei (AGN) observed by XMM-*Newton* in targeted observations, whose data are public as of March 2007. With its 156 sources, this is the largest catalogue of high signal-to-noise X-ray spectra of AGN. All the EPIC pn spectra of the sources in CAIXA were extracted homogeneously and a baseline model was applied in order to derive their basic X-ray properties. These data are complemented by multiwavelength data found in the literature: Black Hole masses, Full Width Half Maximum (FWHM) of Hβ, radio and optical fluxes. Here we describe our homogeneous spectral analysis of the X-ray data in CAIXA and present all the results on the parameters adopted in our best-fit models.

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preprint available at http://arxiv.org/abs/0811.1126

Eddington ratios of faint AGN at intermediate redshift: Evidence for a population of half-starved black holes

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We use one of the deepest spectroscopic samples of broad-line active galactic nuclei (AGN) currently available, extracted from the VIMOS VLT Deep Survey (VVDS), to compute the Mg II and C IV virial-mass estimates of 120 super-massive black holes in the redshift range $1.0 < z < 1.9$ and $2.6 < z < 4.3$. We find that the mass-luminosity relation shows considerably enhanced dispersion towards low AGN luminosities ($\log L_{\rm bol} \sim 45$). At these luminosities, there is a substantial fraction of black holes accreting far below their Eddington limit ($L_{\rm bol}/L_{\rm Edd} < 0.1$), in marked contrast to what is generally found for AGN of higher luminosities. We speculate that these may be AGN on the decaying branch of their lightcurves, well past their peak activity. This would agree with recent theoretical predictions of AGN evolution.

In the electronic appendix of this paper we publish an update of the VVDS type-1 AGN sample, including the first and most of the second-epoch observations. This sample contains 298 objects of which 168 are new.

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AGN-Starburst connection in NGC 7582: GNIRS IFU observations

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We analyse two-dimensional near-IR $K-$band spectra from the inner $660{\times}315\,{\rm pc}^2$ of the Seyfert galaxy NGC 7582 obtained with the Gemini GNIRS IFU at a spatial resolution of $\approx 50\,$pc and spectral resolving power R$\,\approx$5900. The nucleus harbors an unresolved source well reproduced by a blackbody of temperature T$\,\approx$1050 K, which we attribute to emission by circumnuclear dust located closer than 25 pc from the nucleus, with total mass of $\approx 3\times\,10^{-3}\,{\rm M}_\odot$. Surrounding the nucleus, we observe a ring of active star formation, apparently in the galactic plane, with radius of $\approx 190\,$pc, an age of $\approx 5\,$Myr and total mass of ionized gas of $\approx 3\times\,10^{6}\,{\rm M}_\odot$. The radiation of the young stars in the ring accounts for at least 80% of the ionization observed in the Brγ emitting gas, the remaining being due to radiation emitted by the active nucleus. The stellar kinematics was derived using the CO absorption band at $2.29\,\mu$m and reveals: (1) a distorted rotation pattern in the radial velocity field with kinematic center apparently displaced from the nuclear source by a few tens of parsecs; (2) a high velocity dispersion in the bulge of $\sigma_* = 170\,{\rm km\,s^{-1}}$; (3) a partial ring of $\sigma_* = 50\,{\rm km\,s^{-1}}$, located close to the Brγ emitting ring, but displaced by $\approx 50\,$pc towards the nucleus, interpreted as due to stars formed from cold gas in a previous burst of star formation. The kinematics of the ionized gas shows a similar rotation pattern to that of the stars, plus a blueshifted component with velocities $\geq 100\,{\rm km\,s^{-1}}$ interpreted as due to an outflow along the ionization cone, which was partially covered by our observations. The mass outflow rate in the ionized gas was estimated as $\dot{M}_{\rm HII} \approx 0.05\,{\rm M}_\odot\,{\rm yr}^{-1}$, which is one order of magnitude larger than the accretion rate to the active galactic nucleus (AGN), indicating that the outflowing gas does not originate in the AGN, but is instead the circumnuclear gas from the host galaxy being pushed away by a nuclear outflow. The flux distribution and kinematics of the hot molecular gas, traced by the $H_2\,\lambda\,2.22\mu$m emission line, suggests that most of this gas is in the galactic plane. An excess blueshift along PA$\approx -70^\circ$, where a nuclear bar has been observed, can be interpreted as an inflow towards the nucleus. We thus conclude that the H_2 kinematics traces the feeding of the AGN, while the ionized gas kinematics traces its feedback via the outflows. An AGN-Starburst connection in the nucleus of NGC 7582 is supported by the ratio between the mass accretion rate and the star formation rate in the circumnuclear region of $\approx$0.26%, which is close to the expected relation between the mass of the SMBH and that of the host galaxy bulge in galaxies (the Magorrian relation).

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Destruction of molecular gas reservoirs in early-type galaxies by AGN feedback

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Residual star formation at late times in early-type galaxies and their progenitors must be suppressed in order to explain the population of red, passively evolving systems we see today. Likewise, residual or newly accreted reservoirs of molecular gas that are fuelling star formation must be destroyed. This suppression of star formation in early-type galaxies is now commonly attributed to AGN feedback wherein the reservoir of gas is heated and expelled during a phase of accretion onto the central supermassive black hole. However, direct observational evidence for a link between the destruction of this molecular gas and an AGN phase has been missing so far. We present new mm-wavelength observations from the IRAM 30m telescope of a sample of low redshift SDSS early-type galaxies currently undergoing this process of quenching of late-time star formation. Our observations show that the disappearance of the molecular gas coincides within less than 100 Myr with the onset of accretion onto the black hole and is too rapid to be due to star formation alone. Since our sample galaxies are not associated to powerful quasar activity or radio jets, we conclude that low-luminosity AGN episodes are sufficient to suppress residual star formation in early-type galaxies. This 'suppression mode' of AGN feedback is very different from the 'truncation mode' linked to powerful quasar activity during early phases of galaxy formation.

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High-energy particle acceleration and production of ultra-high-energy cosmic rays in the giant lobes of Centaurus A

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The nearby radio galaxy Centaurus A is poorly studied at high frequencies with conventional radio telescopes because of its very large angular size, but is one of a very few extragalactic objects to be detected and resolved by the *Wilkinson Microwave Anisotropy Probe* (*WMAP*). We have used the five-year *WMAP* data for Cen A to constrain the high-frequency radio spectra of the 10-degree giant lobes and to search for spectral changes as a function of position along the lobes. We show that the high-frequency radio spectra of the northern and southern giant lobes are significantly different: the spectrum of the southern lobe steepens monotonically (and is steeper further from the active nucleus) whereas the spectrum of the northern lobe remains consistent with a power law. The inferred differences in the northern and southern giant lobes may be the result of real differences in their high-energy particle acceleration histories, perhaps due to the influence of the northern middle lobe, an intermediate-scale feature which has no detectable southern counterpart. In light of these results, we discuss the prospects for *Fermi Gamma-ray Space Telescope* detections of inverse-Compton emission from the giant lobes and the lobes' possible role in the production of the ultra-high energy cosmic rays (UHECR) detected by the Pierre Auger Observatory. We show that the possibility of a *Fermi* detection depends sensitively on the physical conditions in the giant lobes, with the northern lobe more likely to be detected, and that any emission observed by *Fermi* is likely to be dominated by photons at the soft end of the *Fermi* energy band. On the other hand we argue that the estimated conditions in the giant lobes imply that UHECRs can be

accelerated there, with a potentially detectable γ-ray signature at TeV energies.

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preprint available at http://arXiv.org/abs/0808.1593

VLT/ISAAC Spectra of the Hβ Region in Intermediate-Redshift Quasars III. Hβ Broad Line Profile Analysis and Inferences about BLR Structure

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We present new VLT ISAAC spectra for 30 quasars, which we combine with previous data to yield a sample of 53 intermediate redshift ($z \approx 0.9 - 3.0$) sources. The sample is used to explore properties of prominent lines in the Hβ spectral region of these very luminous quasars.

We compare this data with two large low redshift (z <0.8) samples in a search for trends over almost 6dex in source luminosity.

We find two major trends: (1) a systematic increase of minimum FWHM Hβ with luminosity (discussed in a previous paper). This lower FWHM envelope is best fit assuming that the narrowest sources radiate near the Eddington limit, show line emission from a virialized cloud distribution, and obey a well defined broad line region size vs. luminosity relation. (2) A systematic decrease of equivalent width [OIII]λ5007 (from W≈15 to ∼1Å) with increasing source bolometric luminosity (from $\log L_{\rm bol} \approx 43$ to $\log L_{\rm bol} \approx 49$). Further identified trends require discrimination between so-called Population A and B sources. We generate median composite spectra in six luminosity bins to maximize S/N. Pop. A sources show reasonably symmetric Lorentzian Hβ profiles at all luminosities while Pop. B sources require two component fits involving an unshifted broad and a redshifted very broad component. Very broad Hβ increases in strength with increasing $\log L_{\rm bol}$ while the broad component remains constant resulting in an apparent "Baldwin effect" with equivalent width decreasing from $W \sim$80 to ∼20 Å over our sample luminosity range. The roughly constant equivalent width shown by the Hβ very broad component implies production in optically-thick, photoionized gas. The onset of the redshifted very broad component appears to be a critical change that occurs near the Pop. A-B boundary at FWHM H$\beta \approx$ 4000 km/s which we relate to a critical Eddington ratio (≈ 0.2±0.1).

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preprint http://uk.arxiv.org/abs/0812.0251

Optical Spectroscopy of X-ray sources in the Extended Chandra Deep Field South

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We present the first results of our optical spectroscopy program aimed to provide redshifts and identifications for the X-ray sources in the Extended Chandra Deep Field South. A total of 339 sources were targeted using the IMACS spectrograph at the Magellan telescopes and the VIMOS spectrograph at the VLT. We measured redshifts for 186 X-ray sources, including archival data and a literature search. We find that the AGN host galaxies have on average redder rest-frame optical colors than non-active galaxies, and that they live mostly in the "green valley". The dependence of the fraction of AGN that are obscured on both luminosity and redshift is confirmed at high significance and the observed AGN spatial density is compared with the expectations from existing luminosity functions. These AGN show a significant difference in the mid-IR to X-ray flux ratio for obscured and unobscured AGN, which can be explained by the effects of dust self-absorption on the former. This difference is

larger for lower luminosity sources, which is consistent with the dust opening angle depending on AGN luminosity.

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Constraints on the Low-Energy Cutoff in the Electron Distribution of the PKS 0637-752 Jet

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We re-analyze the Chandra ACIS spectrum of the kpc-scale jet in PKS 0637-752 to investigate the possible low energy cutoff in the relativistic electron spectrum producing the non-thermal radiation in the scenario of inverse Compton emission off the cosmic microwave background. This was among the first objects targeted by the Chandra Observatory and gives a unique opportunity to study the low energy X-ray emission free of detector contamination. As previously reported in the literature, the spectrum can be fit by a power law, with the slope predicted by the radio spectrum, modified by low energy absorption through the Galaxy as determined from the spectrum of the quasar core and by HI 21 cm observations. We obtain a marginally better fit with an model of inverse Compton emission produced by an electron population that exhibits a cutoff at $\gamma_{\rm min}\,\delta_{10}$ between about 50 and 80 (assuming $\Gamma = \delta$). This range for $\gamma_{\rm min}$ is higher than has previously been assumed in broad-band spectral fits to the jet emission. The observed optical flux can be used to place a lower limit on $\gamma_{\rm min}$; the constraint is not very strong, but does suggest that $\gamma_{\rm min}$ must be higher than 1 to avoid overproducing the optical emission. We investigate the effect of uncertainties in the column density for galactic absorption as well as the calibration of Chandra for these early observations. Finally, we discuss the implication of these limits on the jet luminosity in this source.

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A kinematic study of the irregular dwarf galaxy NGC 2366 using H I and Hα observations

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Context. The metal content of dwarf galaxies and the metal enrichment of the intergalactic medium both suggest that mass loss from galaxies is a significant factor for the chemical evolution history of galaxies, in particular of dwarf galaxies. However, no clear evidence for a blow-away in local dwarf galaxies has been found so far.

Aims. Dwarf galaxies provide a perfect environment to study feedback processes because their kinematics and their generally low gravitational potential support the long-term survival of shells, filaments, and holes. We therefore performed a detailed kinematic analysis of the neutral and ionised gas in the nearby star-forming irregular dwarf galaxy NGC 2366 in order to make predictions about the fate of the gas and to get a more complete picture of this galaxy.

Methods. A deep Hα image and Fabry-Perot interferometric data of NGC 2366 were obtained. They were complemented by H I synthesis data from the THINGS survey. We searched for line-splitting both in Hα and H I by performing a Gaussian decomposition. In order to get an idea whether the expansion velocities are high enough for a gas blow-away, we used the pseudo-isothermal halo model which gives us realistic values for the escape velocities of NGC 2366. The good data quality also allowed us to discuss some peculiarities of the morphology and the dynamics in NGC 2366.
Results. A large red-shifted outflow north-west of the Giant Extragalactic H II Region with an expansion velocity of up to $50\,\mathrm{km\,s^{-1}}$ is found in Hα, but not in H I. Additionally, a blue-shifted component north of the Giant Extragalactic H II Region was detected both in Hα and H I with an expansion velocity of up to $30\,\mathrm{km\,s^{-1}}$. A comparison with the escape velocities of NGC 2366 reveals that the gas has not enough kinetic energy to leave the gravitational potential.

Conclusions. This result is in good agreement with hydrodynamic simulations and suggests that we need to examine even less

massive galaxies ($M_{\rm gas} = 10^6\,{\rm M}_\odot$).

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preprint available at http://arxiv.org/abs/0811.2724

Long term Optical and X-ray Variability of the Seyfert Galaxy Markarian 79

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We present the results of concurrent X-ray and optical monitoring of the Seyfert 1 galaxy Mrk 79 over a period of more than five years. We find that on short to medium time-scales (days to a few tens of days) the 2–10 keV X-ray and optical u and V band fluxes are significantly correlated, with a delay between the bands consistent with zero days. We show that most of these variations may be well reproduced by a model where the short-term optical variations originate from reprocessing of X-rays by an optically thick accretion disc. The optical light curves, however, also display long time-scale variations over thousands of days, which are not present in the X-ray light curve. These optical variations must originate from an independent variability mechanism and we show that they can be produced by variations in the (geometrically) thin disc accretion rate as well as by varying reprocessed fractions through changes in the location of the X-ray corona.

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Properties of warm absorbers in active galaxies: a systematic stability curve analysis

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Signatures of warm absorbers are seen in soft X-ray spectra of about half of all Seyfert1 galaxies observed and in some quasars and blazars. We use the thermal equilibrium curve to study the influence of the shape of the ionizing continuum, density and the chemical composition of the absorbing gas on the existence and nature of the warm absorbers. We describe circumstances in which a stable warm absorber can exist as a multiphase medium or one with continuous variation in pressure. In particular we find the following results: i) the warm absorber exists only if the spectral index of the X-ray power-law ionizing continuum $\alpha > 0.2$ and has a multiphase nature if $\alpha \sim 0.8$, which interestingly is the spectral index for most of the observed Seyfert 1 galaxies; ii) thermal and ionization states of highly dense warm absorbers are sensitive to their density if the ionizing continuum is sufficiently soft, i.e. dominated by the ultraviolet iii) absorbing gas with super Solar metallicity is more likely to have a multiphase nature; iv) the nature of the warm absorber is significantly influenced by the absence of iron and associated elements which are produced in the later stages of star formation history in supernovae of type Ia.

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The Reddest DR3 SDSS/XMM-Newton Quasars

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We have cross-correlated the SDSS DR3 Schneider et al. (2005) quasar catalog with the XMM-Newton archive. Color and redshift selections ($g-r \geq 0.5$ and $0.9 < z < 2.1$) result in a sample of 17 red, moderate redshift quasars. The redshift selection minimizes possible contamination due to host galaxy emission and Lyα forest absorption. Both optical and X-ray information are required to distinguish between the two likely remaining causes of the red colors: 1) dust-reddening and 2) an intrinsically red continuum. We find that 7 of 17 quasars can be classified as probable 'intrinsically red' objects. These 7 quasars have unusually broad MgII emission lines (<FWHM>=10,500 km s^{-1}), moderately flat, but unabsorbed X-ray spectra ($< \Gamma >=1.66\pm0.08$), and low accretion rates ($\dot{M}/\dot{M}_{Edd} \sim 0.01$). We suggest low accretion rates as a a possible physical explanation for quasars with intrinsically red optical continua. We find that 8 of 17 quasars can be classified as dust-reddened. Three of these have upper-limits on the absorption column from X-ray spectral fits of N_H = 3-13 x 10^{22} cm^2, while the other five quasars must be absorbed by at least $N_H = 10^{23}$ cm^2 in order to be consistent with a comparably selected $\alpha_{ox} - l_{uv}$ distribution. Two objects in the sample are unclassified.

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Jobs

Postdoctoral Research Position

University of Kentucky
with **Prof. Moshe Elitzur**

E-mail contact: `moshe@pa.uky.edu`

Applications are invited for a postdoctoral research position in theoretical astrophysics to work with Prof. Moshe Elitzur at the University of Kentucky. The start date is around September 2009. Interest in AGN and radiative processes is advantageous. Applicants should send curriculum vita, bibliography and a statement of research interests by e-mail to moshe@pa.uky.edu and arrange for three letters of recommendation to be sent the same way. The initial appointment is for one year, with an expected extension for another year. The review of applications will start at the end of December, and will be continued until the position is filled.

Meetings

IAU Symposium 267
Evolution of Galaxies and Central Black Holes: Feeding and Feedback

Rio de Janeiro, Brazil
10–14 August 2009

Webpage: `http://www.stsci.edu/institute/conference/iau267`
Email: `peterson@astronomy.ohio-state.edu`

It is now widely recognized that nuclear activity is an important ingredient in the evolution of galaxies. With the advent of techniques for estimating AGN black hole masses, even at large redshifts, and the availability of large quasar samples at all redshifts from Chandra, XMM–Newton, the Sloan Digital Sky Survey, and other surveys, the field has undergone transformational change. A major focus has become observational and theoretical investigation of nuclear activity in the context of the galactic environment, which can be described in terms of "feeding" and "feedback." AGN feeding is tightly correlated with redshift-dependent star formation in the host galaxy. AGN feedback, in the form of relativistic jets, massive winds, and intense radiation, has been invoked to solve a broad range of problems that arise in Cold Dark Matter-based models of galaxy formation: setting the critical mass scale for galactic bulges, regulating cooling in clusters, and shutting down star formation. Such feedback, feeding, and their mutual interaction might possibly account for the tight relationship between galactic bulge mass and central black hole mass

The purpose of the proposed symposium is to bring together researchers from different specializations to better define the current global landscape and to motivate new lines of research. The timing of this symposium is propitious: HST is expected to be in its first full cycle after SM4 refurbishment, and ALMA, JWST and LSST, will be on the near-term horizon.

Scientific Organizing Committee:
Chair: Bradley M. Peterson (USA), Roberto Cid Fernandes (Brazil), Suzy Collin (France), Horacio Dottori (Brazil), Martin Elvis (USA), Laura Ferrarese (Canada), Timothy M. Heckman (USA), Guinevere A.M. Kauffmann (Germany), Stefanie Komossa (Germany), Paulina Lira (Chile), Alessandro Marconi (Italy), Hagai Netzer (Israel), Elaine M. Sadler (Australia), Rachel S. Somerville (USA), Thaisa Storchi-Bergmann (Brazil), Keiichi Wada (Japan), and Martin Ward (UK)

The Active Galaxies Newsletter is available on the World Wide Web. You can access it via the University of Manchester home page :- http://www.manchester.ac.uk/jodrellbank/∼agnews
If you move or your e-mail address changes, please send the editor your new address. If the Newsletter repeatedly bounces back from an address then that address is deleted from the mailing list.