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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

Reddening, Emission-Line, and Intrinsic Absorption Properties in the Narrow-Line Seyfert 1 Galaxy Akn 564[1]

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We use *Hubble Space Telescope* UV and optical spectra of the narrow-line Seyfert 1 (NLS1) galaxy Akn 564 to investigate its internal reddening and properties of its emission-line and intrinsic UV absorption gas. We find that the extinction curve of

Akn 564, derived from a comparison of its UV/optical continuum to that of an unreddened NLS1, lacks a 2200 Å bump and turns up towards the UV at a longer wavelength (4000 Å) than the standard Galactic, LMC, and SMC curves. However, it does not show the extremely steep rise to 1200 Å that characterizes the extinction curve of the Seyfert 1 galaxy NGC 3227. The emission-lines and continuum experience the same amount of reddening, indicating the presence of a dust screen that is external to the narrow-line region (NLR). Echelle spectra from the Space Telescope Imaging Spectrograph show intrinsic UV absorption lines due to Lyα, N V, C IV, Si IV, and Si III, centered at a radial velocity of -190 km s^{-1} (relative to the host galaxy). Photoionization models of the UV absorber indicate that it has a sufficient column (N$_H$ = 1.6 x 10^{21} cm^{-2}) and is at a sufficient distance from the nucleus (D $>$ 95 pc) to be the source of the dust screen. Thus, Akn 564 contains a dusty "lukewarm absorber" similar to that seen in NGC 3227.

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On the Nature of Intrinsic Absorption in Reddened Seyfert 1 Galaxies

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We discuss the origin of the "dusty lukewarm absorber", which we previously identified in the reddened Seyfert 1 galaxies NGC 3227 and Akn 564. This absorber is characterized by saturated UV absorption lines (C IV, N V) near the systemic velocity of the host galaxy, and is likely responsible for reddening both the continuum and the emission lines (including those from the narrow-line region) from these Seyferts. From a large sample of Seyfert 1 galaxies, we find that continuum reddening (as measured by UV color) tends to increase with inclination of the host galaxy. Furthermore, reddened, inclined Seyfert galaxies observed at moderate to high spectral resolution all show evidence for dusty lukewarm absorbers. We suggest that these absorbers lie in the plane of the host galaxy at distances $>$100 pc from the nucleus, and are physically distinct from the majority of intrinsic absorbers that are outflowing from the nucleus.

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Nonstandard Central Engines in Nearby Galaxies

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We argue that nearby galaxy nuclei contain massive black holes that are fueled by low radiative efficiency accretion flows.

To appear in *Issues in Unification of AGNs*, ed. R. Maiolino, A. Marconi, & N. Nagar (San Francisco: ASP), in press.

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The Population of AGNs in Nearby Galaxies

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This contribution reviews the properties of nuclear activity in nearby galaxies, with emphasis on results obtained from current optical surveys and multiwavelength follow-up observations thereof.

To appear in *IAU Colloq. 184, AGN Surveys*, d. R. F. Green, E. Ye. Khachikian, & D. B. Sanders (San Francisco: ASP), in press.

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On the Relationship Between Radio Emission and Black Hole Mass in Galactic Nuclei

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We use a comprehensive database of black hole masses ($M_{\rm BH}$) and nuclear luminosities to investigate the relationship between radio emission and $M_{\rm BH}$. Our sample covers a wide range of nuclear activity, from nearby inactive nuclei to classical Seyfert 1 nuclei and luminous quasars. Contrary to some previous studies, we find that the radio continuum power, either integrated for the entire galaxy or isolated for the core, correlates poorly with $M_{\rm BH}$. The degree of nuclear radio loudness, parameterized by the radio-to-optical luminosity ratio R, also shows no clear dependence on $M_{\rm BH}$. Radio-loud nuclei exist in galaxies with a wide range of $M_{\rm BH}$, from $\sim 10^6$ $M_\odot$ to a few$\times 10^9$ $M_\odot$, and in a variety of hosts, from disk-dominated spirals to giant ellipticals. We demonstrate that R is strongly inversely correlated with $L/L_{\rm E}$, the ratio of nuclear luminosity to the Eddington luminosity, and hence with mass accretion rate. Most or all of the weakly active nuclei in nearby galaxies are radio-loud, highly sub-Eddington systems that are plausibly experiencing advection-dominated accretion.

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An Efficient Strategy to Select Targets for Gas-Dynamical Measurements of Black Hole Masses Using the *Hubble Space Telescope*

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Gas-dynamical studies using the *Hubble Space Telescope* are an integral component for future progress in the search for massive black holes in galactic nuclei. Here we present an extensive set of gas rotation curves obtained with the Space Telescope Imaging Spectrograph for the central regions of 23 disk galaxies. We find that the bulges of randomly selected, nearby spiral and S0 galaxies generally do not contain well-defined gaseous disks. Only 15%–20% of disk galaxies have regular, symmetric velocity fields useful for dynamical analysis. Through comparison of the kinematics with *Hubble Space Telescope* images of the nuclear regions, we show that the probability of success can be significantly boosted by preselecting objects whose central dust lanes follow a well-ordered, circularly symmetric pattern. The dust morphology can be ascertained efficiently by visual inspection of unsharp-masked images.

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Nuclear Cusps and Cores in Early-type Galaxies As Relics of Binary Black Hole Mergers

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We present an analysis of the central cusp slopes and core parameters of early-type galaxies using a large database of surface brightness profiles obtained from *Hubble Space Telescope* observations. We examine the relation between the central cusp slopes, core parameters, and black hole masses in early-type galaxies, in light of two models that attempt to explain the formation of cores and density cusps via the dynamical influence of black holes. Contrary to the expectations from adiabatic-growth models, we find that the cusp slopes do not steepen with increasing black hole mass fraction. Moreover, a comparison of kinematic black hole mass measurements with the masses predicted by the adiabatic models shows that they overpredict the masses by a factor of $\sim$3. Simulations involving binary black hole mergers predict that both the size of the core and the central mass deficit correlate with the final black hole mass. These relations are qualitatively supported by the present data.

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High-Resolution Mid-Infrared Morphology of Cygnus A

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We present subarcsecond resolution mid-infrared images at 10.8 and 18.2 microns of Cygnus A. These images were obtained with the University of Florida mid-IR camera/spectrometer OSCIR at the Keck II 10-m telescope. Our data show extended mid-IR emission primarily to the east of the nucleus with a possible western extension detected after image deconvolution. This extended emission is closely aligned with the bi-conical structure observed at optical and near-IR wavelengths by the HST. This emission is consistent with dust heated from the central engine of Cygnus A. We also marginally detect large-scale low level emission extending > 1.5 kpc from the nucleus which may be caused by in-situ star formation, line emission, and/or PAH contamination within the bandpass of our wide N-band filter.

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Discovery of very extended emission-line region around the Seyfert 2 galaxy NGC 4388

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We found a very large, ~ 35 kpc, emission-line region around the Seyfert type 2 galaxy NGC 4388, using deep narrow-band imaging with the prime focus camera (Suprime-Cam) of the Subaru telescope. This region consists of many faint gas clouds or filaments, and extends northeastwards from the galaxy. The typical Hα luminosity $L(\mathrm{H}\alpha)$ of the clouds is $\sim 10^{37}$ erg s^{-1}, and the total $L(\mathrm{H}\alpha)$ of the region within 10 kpc from the nucleus is $\sim 2 \times 10^{38}$ erg s^{-1}, which corresponds to an ionized gas mass of $\sim 10^5 M_\odot$. The map of the emission-line intensity ratio $I([\mathrm{O\ III}])/I(\mathrm{H}\alpha)$ indicates that the inner ($r < 12$ kpc) region of the VEELR may be excited by nuclear ionizing radiation. The excitation mechanism of the outer ($r > 12$ kpc) region is unclear, but it is likely that the nuclear radiation is also a dominant source of its ionization. We discuss the origin of the ionized gas. Two plausible origins of the gas in the VEELR are (i) the tidal debris resulting from a past interaction with a gas-rich dwarf galaxy, i.e., a minor merger, or (ii) the interstellar medium of NGC 4388, stripped by the ram pressure of the hot intracluster medium of the Virgo cluster.

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HST Imaging in the Chandra Deep Field South: II. WFPC2 Observations of an X-Ray Flux-Limited Sample from the 1 Msec Chandra Catalog

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We present HST/WFPC2 observations of a well-defined sample of 40 X-ray sources with X-ray fluxes above the detection threshold of the full 1 Msec Chandra Deep Field South (CDFS). The sensitivity and spatial resolution of our HST observations are sufficient to detect the optical counterparts of 37 of the X-ray sources, yielding information on their morphologies and environments. In this paper we extend the results obtained in our previous study on the 300 ks CDFS X-ray data (Schreier et al. 2001, Paper I). Specifically, we show that the optical counterparts to the X-ray sources are divided into two distinct populations: 1) an optically faint group with relatively blue colors, similar to the faint blue field galaxy population, and 2) an optically brighter group, including resolved galaxies with average colors significantly redder than the corresponding bright field galaxy population. The brighter objects comprise a wide range of types, including early and late type galaxies, starbursts, and AGN. By contrast, we show that the faint blue X-ray population are most consistent with being predominantly Type 2 AGN of low to moderate luminosity, located at higher redshifts ($z \sim 1-2$). This conclusion is supported by luminosity function models of the various classes of objects. Hence, the combination of deep X-ray data with the high spatial resolution of HST are for the first time allowing us to probe the faint end of the AGN luminosity function at cosmologically interesting redshifts.

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Detection of Circular Polarization in M81*

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We report the detection of circular polarization in the compact radio jet of the nearby spiral galaxy M81 (M81*). The observations were made with the Very Large Array at 4.8 and 8.4 GHz and circular polarization was detected at both frequencies. We estimate a value of $m_c = 0.54 \pm 0.06 \pm 0.07\%$ at 8.4 GHz and $m_c = 0.27 \pm 0.06 \pm 0.07\%$ at 4.8 GHz for the fractional circular polarization. The errors are separated into statistical and systematic terms. The spectrum of the circular polarization is possibly inverted which would be unusual for AGN. We also detected no linear polarization in M81* at a level of 0.1% implying that the source has a very high circular-to-linear polarization ratio as found so far only in Sgr A*, the central radio source in our Galaxy. This further supports the idea that M81* is a scaled-up version of Sgr A* and suggests that the polarization properties are intrinsic to the two sources and are not caused by a foreground screen in the Galaxy.

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Reliability of astrophysical jet simulations in 2D

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We examine the convergence behavior and inter-code reliability of astrophysical jet simulations in axial symmetry. We consider both pure hydrodynamic jets and jets with a dynamically significant magnetic field. The setups were chosen to match the setups of two other publications, and recomputed with the MHD code NIRVANA. We show that NIRVANA and the two other codes give comparable, but not identical results. We explain the differences by the different application of artificial viscosity in the three codes and numerical details, which can be summarized in a resolution effect, in the case without magnetic field: NIRVANA turns out to be a fair code of medium efficiency. It needs approximately twice the resolution as the code by Lind (Lind et al. 1989) and half the resolution as the code by Kössl (Kössl & Müller 1988). We find that some global properties of a hydrodynamical jet simulation, like e.g. the bow shock velocity, converge at 100 points per beam radius (ppb) with NIRVANA. The situation is quite different after switching on the toroidal magnetic field: In this case, global properties converge even at 10 ppb. In both cases, details of the inner jet structure and especially the terminal shock region are still insufficiently resolved, even at our highest resolution of 70 ppb in the magnetized case and 400 ppb for the pure hydrodynamic jet. The magnetized jet even suffers from a fatal retreat of the Mach disk towards the inflow boundary, which indicates that this simulation does not converge, in the end. This is also in definite disagreement with earlier simulations, and challenges further studies of the problem with other codes. In the case of our highest resolution simulation, we can report two new features: First, small scale Kelvin-Helmholtz instabilities are excited at the contact discontinuity next to the jet head. This slows down the development of the long wavelength Kelvin-Helmholtz instability and its turbulent cascade to smaller wavelengths. Second, the jet head develops Rayleigh-Taylor instabilities which manage to entrain an increasing amount of mass from the ambient medium with resolution. This region extends in our highest resolution simulation over 2 jet radii in the axial direction.

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UV Imaging Polarimetry of the Seyfert 2 Galaxy Mrk 3

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We present UV imaging polarimetry data of the Seyfert 2 galaxy Mrk 3 taken by the Hubble Space Telescope. The polarized flux is found to be extended to ~ 1 kpc from the nucleus, and the position angles of polarization are centrosymmetric, confirming that the polarization is caused by scattering. We determine the location of the hidden nucleus as the center of this centrosymmetric pattern. From the polarization images taken in two broad bands, we have obtained the color distribution of the polarized flux. Some regions have blue polarized flux, consistent with optically-thin dust scattering, but some bright knots have a color similar to that of Seyfert 1 nucleus. Also, the recent Chandra X-ray observation suggests that the ratio of scattered UV flux to scattered X-ray flux is rather similar to the intrinsic UV/X-ray ratio in a Seyfert 1 nucleus, if the observed extended X-ray continuum is scattered light. While the scattered X-ray would be essentially from electron scattering, the UV slope and UV/X-ray ratio both being similar to Seyfert 1's would lead to two possibilities as to the nature of the UV scatterers. One is that the UV may also be scattered by electrons, in which case the scattering gas is somehow dust-free. The other is that the UV is scattered by dust grains, but the wavelength-independent UV scattering with low efficiency indicated by the UV slope and UV/X-ray ratio would suggest that the grains reside in UV-opaque clouds, or the dust might be mainly composed of large grains and lacks small-grain population.

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The Origin of Radio Emission in Low-Luminosity Active Galactic Nuclei: Jets, Accretion Flows, or Both?

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The low-luminosity active galactic nuclei in NGC 3147, NGC 4203, and NGC 4579 have been imaged at four frequencies with the Very Long Baseline Array. The galaxies are unresolved at all frequencies, with size upper limits of 10^3–10^4 times the Schwarzschild radii of their central massive black holes. The spectral indices between 1.7 and 5.0 GHz range from 0.2 to 0.4; one and possibly two of the galaxies show spectral turnovers between 5.0 and 8.4 GHz. The high brightness temperatures ($T_b \gtrsim 10^9$ K) and relatively straight spectra imply that free-free emission and/or absorption cannot account for the slightly inverted spectra. Although the radio properties of the cores superficially resemble predictions for advection-dominated accretion flows, the radio luminosities are too high compared to the X-ray luminosities. We suggest that the bulk of the radio emission is generated by a compact radio jet, which may coexist with a low radiative efficiency accretion flow.

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The Frequency of Active and Quiescent Galaxies with Companions: Implications for the Feeding of the Nucleus

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We analyze the idea that nuclear activity, either AGN or star formation, can be triggered by interactions, studying the percentage of active, HII and quiescent galaxies with companions. Our sample was selected from the Palomar survey, and avoids selection biases faced by previous studies. This sample was split into 5 different groups, Seyfert galaxies, LINERs, transition galaxies, HII galaxies and absorption line galaxies. The comparison between the local galaxy density distributions of the different groups showed that in most cases there is no statistically significant difference among galaxies of different activity types, with the exception that absorption line galaxies are seen in higher density environments, since most of them are in the Virgo cluster. The comparison of the percentage of galaxies with nearby companions showed that there is a higher percentage of LINERs, transition, and absorption line galaxies with companions than Seyferts and HII galaxies. However, we find that when we consider only galaxies of similar morphological types (ellipticals or spirals), there is no difference in the percentage of galaxies with companions among different activity types, indicating that the former result was due to the morphology-density effect. Also, only small differences are found when we consider galaxies with similar Hα luminosities. The comparison between HII galaxies of different Hα luminosities shows that there is a significantly higher percentage of galaxies with companions among HII galaxies with L(Hα)$> 10^{39}$ erg s^{-1}, than among those with L(Hα)$\leq 10^{39}$ erg s^{-1}, indicating that interactions increase the amount of circumnuclear star formation, in agreement with previous results. The fact that we find that galaxies of different activity types have the same percentage of companions, suggests that interactions between galaxies is not a necessary condition to trigger the nuclear activity in AGNs. We compare our results with previous ones and discuss their implications.

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The Importance of Shocks in the Ionization of the Narrow Line Region of Seyferts

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We discuss the viability of shocks as the principal source of ionization for the Narrow Line Region of Seyfert galaxies. We present the preliminary results of [OIII]λ5007Å and radio 3.6 cm imaging surveys of Seyferts, discuss the effects of shocks in the ionization of two galaxies, and also calculate an upper limit to the Hβ luminosity that can be due to shocks in 36 galaxies with unresolved radio emission. We show that, for favored values of the shock parameters, that shocks cannot contribute more than ~15% of the ionizing photons in most galaxies.

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Testing the Unified Model with an Infrared Selected Sample of Seyferts

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We present a series of statistical tests using homogeneous data and measurements for a sample of Seyfert galaxies. These galaxies were selected from mostly isotropic properties, their far infrared fluxes and warm infrared colors, which provide a considerable advantage over the criteria used by most investigators in the past, like ultraviolet excess. Our results provide strong support for a Unified Model in which Seyferts 2's contain a torus seen more edge-on than in Seyferts 1's and show that previous results showing the opposite were most likely due to selection effects.

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First Results from the COLA Project- the Radio-FIR Correlation and Compact Radio Cores in Southern COLA Galaxies

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We present the first results from the COLA (Compact Objects in Low-power AGN) project which aims to determine the relationship between one facet of AGN activity, the compact radio core, with star formation in the circumnuclear region of the host galaxy. This will be accomplished by the comparison of the multi-wavelength properties of a sample of AGN with compact radio cores, to those of a sample of AGN without compact cores and a matched sample of galaxies without AGN.

In this paper we discuss the selection criteria for our galaxy samples and present the initial radio observations of the 107 Southern ($\delta < 0^o$) galaxies in our sample. Low-resolution ATCA observations at 4.8, 2.5 and 1.4 GHz and high resolution, single baseline snapshots at 2.3 GHz with the Australian LBA are presented. We find that for the majority of the galaxies in our sample, the radio luminosity is correlated with the FIR luminosity. However, a small number of galaxies exhibit a significant radio excess causing them to depart from the FIR-radio correlation.

Compact radio cores are detected at fluxes $>$ 1.5mJy in 9 of the 105 galaxies observed with the LBA. The majority (8/9) of these galaxies exhibit a significant radio excess and 50% (7/14) of the galaxies which lie above the radio-FIR correlation by more than 1σ have compact radio cores. The emission from the compact cores is too weak to account for this radio excess, implying that there are radio structures associated with the compact cores which extend further than the 0.05 arcsec resolution (corresponding to a linear scale 11-22pc) of the LBA. There is no evidence that the radio luminosity of the compact cores is correlated with the FIR galaxy luminosity, indicating that the core contributes little to the overall FIR emission of the galaxy.

The galaxies with compact cores tend to be classified optically as AGN, with two thirds (6/9) exhibiting Seyfert-like optical emission line ratios, and the remaining galaxies classified either as composite objects (2/9) or starburst (1/9). The galaxies classified optically as AGN also exhibit the largest radio excesses and we therefore conclude that a large radio excess on the radio-FIR correlation is a strong indication of an AGN with a compact radio core.

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A Chandra Study of Cygnus A — II. The Nucleus

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We report *Chandra* ACIS and quasi-simultaneous *RXTE* observations of the nearby, powerful radio galaxy Cygnus A, with the present paper focusing on the properties of the active nucleus. In the *Chandra* observation, the hard (> a few keV) X-ray emission is spatially unresolved with a size $\lesssim 1''$ (1.5 kpc, $H_0 = 50$ km s^{-1} Mpc^{-1}) and coincides with the radio and near infrared nuclei. In contrast, the soft (< 2 keV) emission exhibits a bi-polar nebulosity that aligns with the optical bi-polar continuum and emission-line structures and approximately with the radio jet. In particular, the soft X-ray emission corresponds very well with the [O III] λ5007 and Hα + [N II] $\lambda\lambda$6548, 6583 nebulosity imaged with HST. At the location of the nucleus there is only weak soft X-ray emission, an effect that may be intrinsic or result from a dust lane that crosses the nucleus perpendicular to the source axis. The spectra of the various X-ray components have been obtained by simultaneous fits to the 6 detectors. The compact nucleus is detected to 100 keV and is well described by a heavily absorbed power law spectrum with $\Gamma_h = 1.52^{+0.12}_{-0.12}$ (similar to other narrow line radio galaxies) and equivalent hydrogen column $N_H(\mathrm{nuc}) = 2.0^{+0.1}_{-0.2} \times 10^{23}$ cm^{-2}. This column is compatible with the dust obscuration to the near infrared source for a normal gas to dust ratio. The soft (< 2 keV) emission from the nucleus may be described by a power law spectrum with the same index (i.e. $\Gamma_l = \Gamma_h$), though direct fits suggests a slightly larger value for Γ_l. Narrow emission lines from highly ionized neon and silicon, as well as a "neutral" Fe Kα line, are detected in the nucleus and its vicinity ($r \lesssim 2$ kpc). The equivalent width (EW) of the Fe Kα line (182^{+40}_{-54} eV) is in good agreement with theoretical predictions for the EW versus $N_H(\mathrm{nuc})$ relationship in various geometries. An Fe K edge is also seen. The *RXTE* observations indicate a temperature of $kT = 6.9^{+0.3}_{-1.0}$ keV for the cluster gas (discussed in Paper III of this series) and cluster emission lines of Fe Kα and Fe Kβ and / or Ni Kα.

We consider the possibility that the extended soft X-ray emission is electron-scattered nuclear radiation. Given that 1% of the unabsorbed 2 – 10 keV nuclear radiation would have to be scattered, the necessary gas column ($N_H(\mathrm{scattering}) \simeq 3.5 \times 10^{22}$ cm^{-2}) would absorb the X-rays rather than scatter them if the gas is cold. Thus the scattering plasma must be highly ionized. If this ionization is achieved through photoionization by the nucleus, the ionization parameter $\xi > 1$ erg cm s^{-1} and the electron density $n_e \simeq 6$ cm^{-3} given the observed distance of the soft X-ray emission from the nucleus. The electron column density inferred from the X-ray observations is much too low to account for the extended optical scattered light, strongly suggesting that the polarized optical light is scattered by dust. The presence of highly ionized Ne lines in the soft X-ray spectrum requires $20 \lesssim \xi \lesssim 300$ erg cm s^{-1}; these lines may originate closer to the nucleus than the extended soft continuum or in a lower density gas. A collisionally-ionized thermal model of the extended soft X-rays cannot be ruled out, but is unattractive in view of the low metal abundance required ($Z = 0.03 Z_\odot$).

The hard X-ray to far-infrared ratio for the nucleus of Cygnus A is similar to that seen in Seyfert 1 and unobscured radio galaxies. By means of the correlation between hard X-ray luminosity and nuclear optical absolute magnitude for these classes of object, we estimate $M_B = -22.4$ for Cygnus A, near the borderline between Seyferts and QSOs.

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Measuring Black Hole Masses Using Ionized Gas Kinematics

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We describe techniques for measuring the central masses of galaxies using emission-line kinematics observed with the *Hubble Space Telescope*. For accurate results, it is necessary to model various instrumental effects, particularly the blurring due to the telescope PSF and the width of the spectroscopic aperture. Observations of nuclear gas disks often reveal substantial internal velocity dispersions in the gas, suggesting that the disks may be partially pressure-supported. We also describe a technique for fitting 2-dimensional spectroscopic data directly in pixel space. This method may be useful for objects such as M84 that show highly complex and asymmetric line profiles.

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Limits on the Mass of the Central Black Hole in 16 Nearby Bulges

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We report upper limits on the masses of black holes that can be present in the centers of sixteen nearby galaxy bulges. These limits $M_{\rm BH}^{lim}$ for our statistically complete sample were derived from the modeling of the central emission-line widths ([N II] or [S II]), observed over a $0.25'' \times 0.2''$ ($R \lesssim 9$ pc) aperture. The experiment has a mean detection sensitivity of $\sim 3.9 \times 10^6$ M$_\odot$. For three sample members with direct determinations of $M_{\rm BH}$ our upper limits agree within the uncertainties, while in general our upper limits are found to be close to the masses measured in other bulges with global properties similar to ours. Remarkably, our limits lie quite closely to the recently derived $M_{\rm BH} - \sigma_\star$ relation. These results support a picture wherein the black-hole mass and overall galaxy structure are closely linked, as galaxies with exceptionally high $M_{\rm BH}$ at a given $\sigma_\star$ apparently are rare.

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A pair of seyferts identified from a ROSAT bright source

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We report the discovery of a pair of Seyfert galaxies identified in the ROSAT bright source, 1RXS J000306.3–041932. The two Seyferts have the same redshift of 0.106. The angular distance between them is $\sim 23''$, corresponding to a projected separation of ~ 73 kpc, and suggesting an interacting system. We argue, from its weak IR emission and relatively large nuclear separation, that the system is an example of the interaction between AGNs, rather than interaction-triggered AGN activity.

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