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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.
Matt Redman

Abstracts of recently accepted papers

What Powers the Compact Radio Emission in Nearby Elliptical and S0 Galaxies?

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Many nearby early-type (elliptical and S0) galaxies contain weak (milli-Jansky level) nuclear radio sources on scales a few hundred parsecs or less. The origin of the radio emission, however, has remained unclear, especially in volume-limited samples that select intrinsically less luminous galaxies. Both active galactic nuclei and nuclear star formation have been suggested as possible mechanisms for producing the radio emission. This paper utilizes optical spectroscopic information to address this issue. A substantial fraction of the early-type galaxies surveyed with the Very Large Array by Wrobel & Heeschen (1991) exhibits detectable optical emission lines in their nuclei down to very sensitive limits. Comparison of the observed radio continuum power with that expected from the thermal gas traced by the optical emission lines implies that the bulk of the radio emission is nonthermal. Both the incidence and the strength of optical line emission correlate with the radio power. At a fixed line luminosity, ellipticals have stronger radio cores than S0s. The relation between radio power and line emission observed in this sample is consistent with the low-luminosity extension of similar relations seen in classical radio galaxies and luminous Seyfert nuclei. A plausible interpretation of this result is that the weak nuclear sources in nearby early-type galaxies are the low-luminosity counterparts of more powerful AGNs. The spectroscopic evidence supports this picture. Most of the emission-line objects are optically classified as Seyfert nuclei or low-ionization nuclear emission-line regions (LINERs), the majority of which are likely to be accretion-powered sources.

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Preprint can be retrieved from http://xxx.lanl.gov/find/astro-ph (astro-ph/9808123)

The giant-amplitude X-ray outburst in NGC 5905 – a tidal disruption event ?

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NGC 5905 underwent a giant X-ray outburst, with a change in *ROSAT* photon countrate of a factor ~100. The outburst spectrum is very soft and luminous (Bade, Komossa & Dahlem 1996). Remarkably, the optical pre-outburst emission line spectrum of NGC 5905 is that of an HII-type galaxy, i.e. does not show any signs of Seyfert activity. One exciting explanation of the X-ray observation is that we may have witnessed the tidal disruption of a star by a supermassive black hole (SMBH) residing in the nucleus of this galaxy. The expected flare of electromagnetic radiation being produced when the stellar debris is swallowed by the black hole was proposed by Rees (1988) as a means of tracing SMBHs in nearby non-active galaxies. In the present work, we discuss this and other possible outburst scenarios through an analysis of *ROSAT* PSPC and new HRI X-ray observations of NGC 5905. We also present *simultaneous* and long-term optical photometry of NGC 5905 as well as follow-up optical spectroscopy.

4 pages, to appear in the proceedings of *Highlights in X-ray Astronomy*, Garching, June 1998, B. Aschenbach et al. (eds)

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Bidimensional Spectroscopy with Optical Fibers: Kinematics of NGC 1068.

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We have obtained two dimensional optical spectroscopy of the central $24'' \times 20''$ of NGC 1068, using an optical fiber system. These data have been used to discuss the gas and stellar kinematics in the complex environment of this Seyfert 2 galaxy. The velocity field of the ionized gas shows a strong S-distortion with a kinematics center placed $\sim 1''.3$ NE of the optical nucleus. The stellar velocity field indicates regular rotation of two distinct stellar systems which kinematics centers are offset by $\sim 2''.5$.

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Two-Dimesional Spectroscopy in the Circumnuclear Region of the Seyfert 1 Ring Galaxy NGC 985

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We present two-dimensional optical spectroscopy of the central region ($9.4'' \times 12.2''$) of the Seyfert 1 ring galaxy NGC 985 obtained with an optical-fiber system (2D-FIS). The 95 spectra presented here include the Hβ–[O III] $\lambda\lambda$ 4959,5007 emission lines and the Mg Ib absorption lines, which permit the study of the distribution and kinematics of the ionized gas and the stars in two dimensions.

In agreement with the results of other authors, the continuum maps show the presence of two maxima: the bright Seyfert 1 nucleus and a second nucleus located about $3.7''$ to the NW. These observations confirm that this second nucleus is an extragalactic object at the same redshift as that of NGC 985.

These observations indicate an anisotropic distribution of the ionized gas around the Seyfert nucleus. Despite of this, the velocity field of the ionized gas shows a rather regular pattern, its general kinematic properties being similar to those found in other un-perturbed spiral Seyfert galaxies. Many of the spectra in the region between the Seyfert and the secondary nucleus have asymmetric and relatively broad [O III] emission-line profiles.

The kinematic center of the stellar velocity field is located in the neigborhood of the Seyfert nucleus, suggesting that this nucleus is related to the main stellar component. Therefore, these observations support the hypothesis that NGC 985 is the result of a two-galaxy collision in which the intruder (elliptical or spheroidal) galaxy would be what is now the secondary nucleus, while the Seyfert activity is associated with the nucleus of the primary disk galaxy.

In spite of the strong disruption which defines the large-scale morphology of NGC 985, the stellar and ionized gas kinematics do not appear significantly perturbed in the circumnuclear region.

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The broad-band X-ray spectrum of Mrk 3

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We have used *non-simultaneous Ginga*, *ASCA* and *ROSAT* observations to investigate the complex X-ray spectrum of the Seyfert 2 galaxy Mrk 3. We find that the composite spectrum can be well described in terms of a heavily cut-off hard X-ray continuum, iron K_α emission and a soft X-ray excess, with spectral variability confined to changes in the continuum normalisation and the flux in the iron line. Previous studies have suggested that the power-law continuum in Mrk 3 is unusually hard. We obtain a canonical value for the energy index of the continuum (i.e. $\alpha \approx 0.7$) when a warm absorber (responsible for an absorption edge observed near 8 keV) is included in the spectral model. Alternatively, the inclusion of a reflection component yields a comparable power-law index. The soft-excess flux cannot be modelled solely in terms of pure electron scattering of the underlying power-law continuum. However, a better fit to the spectral data is obtained if we include the effects of both emission and absorption in a partially photoionized scattering medium. In particular the spectral feature prominent at ~ 0.9 keV could represent O VIII recombination radiation produced in a hot photoionized medium. We discuss our results in the context of other recent studies of the soft X-ray spectra of Seyfert 2 galaxies.

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preprint available at http://xxx.lanl.gov/archive/astro-ph (astro-ph/9804247)

Steps Toward Determination of the Size and Structure of the Broad-Line Region in Active Galactic Nuclei. XV. Long-Term Optical Monitoring of NGC 5548

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We present the results of three years of ground-based observations of the Seyfert 1 galaxy NGC 5548, which combined with previously reported data, yield optical continuum and broad-line Hβ light curves for a total of eight years. The light curves consist of over 800 points, with a typical spacing of a few days between observations. During this eight-year period, the nuclear continuum has varied by more than a factor of seven, and the Hβ emission line has varied by a factor of nearly six. The Hβ emission line responds to continuum variations with a time delay or lag of $\sim$ 10–20 days, the precise value varying somewhat from year to year. We find some indications that the lag varies with continuum flux in the sense that the lag is larger when the

source is brighter.

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preprint available at http://www.astronomy.ohio-state.edu/~agnwatch/ or at astro-ph (paper 9808236)

Kinematics of the Narrow-Line Region of NGC 1068

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We investigated the kinematics of the Narrow Line Region of NGC 1068. In order to study the kinematics and to determine whether the unusual broad line width can be attributed to motion of NLR clouds in a deep gravitational potential or to expanding shocks, we carried out spatially resolved echelle spectroscopy. High spectral resolution enables the identification of individual clouds in long slit spectra even if their angular separation is much smaller than the seeing limited resolution of ground-based instruments.
Most of the [OIII] line emission can be attributed to 12 clouds with an average angular separation of about 0."3. These clouds differ in peak velocity by up to 2000 km s^{-1}, spanning the whole range of the integrated line profile with FWHM = 1150 km s^{-1}. The clouds do not delineate a simple rotational velocity field. We find evidence for shocks due to the interaction of the radio jet with the ambient NLR gas. The clouds which are attributed to shocks have a width of 350 km s^{-1} to 600 km s^{-1} while clouds with FWHM $\simeq$ 200 km s^{-1} seem to follow a circular velocity field. Therefore, the line width of individual clouds are an essential contribution to the integrated line width of the NLR of NGC 1068 which is not due only to gravitational forces but shocks playing an important role.

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A comparison of the optical properties of radio-loud and radio-quiet quasars

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We have made radio observations of 87 optically selected quasars at 5 GHz with the VLA in order to measure the radio power for these objects and hence determine how the fraction of radio-loud quasars varies with redshift and optical luminosity. The sample has been selected from the recently completed Edinburgh Quasar Survey and covers a redshift range of $0.3 \leq z \leq 1.5$ and an optical absolute magnitude range of $-26.5 \leq M_B \leq -23.5$ (h,q_0 =1/2). We have also matched up other existing surveys with the FIRST and NVSS radio catalogues and combined these data so that the optical luminosity-redshift plane is now far better sampled than previously. We have fitted a model to the probability of a quasar being radio-loud as a function of absolute magnitude and redshift and from this model infer the radio-loud and radio-quiet optical luminosity functions. The radio-loud optical luminosity function is featureless and flatter than the radio-quiet one. It evolves at a marginally slower rate if quasars evolve by density evolution, but the difference in the rate of evolutions of the two different classes is much less than was previously thought. We show, using Monte-Carlo simulations, that the *observed* difference in the shape of the optical luminosity functions can be partly accounted for by Doppler boosting of the optical continuum of the radio-loud quasars and explain how this can be tested in the future.

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