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

XMM-Newton Observations of two high redshift quasars: RX J1028–0844 and BR 0351–1034

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We report the results of XMM-Newton observations of two high redshift quasars, one radio-loud, RX J1028.6–0844 (z=4.276) and one radio-quiet, BR 0351–1034 (z=4.351). We find that the evidence for strong excess absorption towards RX J1028–0844 is marginal at best, contrary to previous claims. The superior sensitivity and broader, softer energy range of XMM-Newton (0.2-10 keV) allows better determination of spectral parameters than much deeper ASCA observations (0.8-7 keV). Our XMM-Newton observations call into question several other ASCA results of strong absorption towards high redshift radio-loud quasars. RX J1028.6–0844 occupies the same parameter space in broad band spectral properties as the low redshift BL Lac objects, showing no obvious evolution with redshift. The radio-quiet quasar BR 0351–1024 became fainter between ROSAT and XMM observations by a factor of at least 5, but with the present data we cannot determine whether there is an associated spectral change. These observations do not support previous claims of weaker X-ray emission from high redshift radio-quiet quasars. The soft X-ray spectral slope required to reconstruct the ROSAT PSPC hardness ratio of BR 0351–1034 is about α_X=3.5, the steepest X-ray slope ever observed in a high redshift quasar, and similar to that of low redshift Narrow Line Seyfert 1 galaxies.

Accepted by Astron. J. (scheduled for Jan. 2004)

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preprint available at http://arxiv.org/abs/astro-ph/0310188

From the Circumnuclear Disk in the Galactic Center to thick, obscuring tori of AGNs

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We compare three different models of clumpy gas disk and show that the Circumnuclear Disk (CND) in the Galactic Center and a putative, geometrically thick, obscuring torus are best explained by a collisional model consisting of quasi-stable, self-gravitating clouds. Kinetic energy of clouds is gained by mass inflow and dissipated in cloud collisions. The collisions give rise to a viscosity in a spatially averaged gas dynamical picture, which connects them to angular momentum transport and mass inflow. It is found that CND and torus share the same gas physics in our description, where the mass of clouds is 20 - 50 $M_\odot$ and their density is close to the limit of disruption by tidal shear. We show that the difference between a transparent CND and an obscuring torus is the gas mass and the velocity dispersion of the clouds. A change in gas supply and the dissipation of kinetic energy can turn a torus into a CND-like structure and vice versa. Any massive torus will naturally lead to sufficiently high mass accretion rates to feed a luminous AGN. For a geometrically thick torus to obscure the view to the center even super-Eddington accretions rates with respect to the central black hole are required.

Accepted by Astronomy & Astrophysics

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MM-Newton observations of the two X-ray weak quasars PG 1411+442 and Mrk 304

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We present the results of XMM-Newton observations of two X-ray weak quasars, PG 1411+442 and Mrk 304. In both cases the spectra can basically be represented by hard power laws with photon indices typical for radio-quiet quasars, heavily intrinsically absorbed by column densities of $\sim 2 \times 10^{23}$ cm^{-2} in PG 1411+442 and $\sim 4 \times 10^{22}$ cm^{-2} in Mrk 304. The data require in both cases an additional steep ($\Gamma \sim 3$) soft power law component, absorbed only by the galactic column density towards the quasars. The soft parts of the spectra exhibit additional complex structures like emission line features around ~ 0.59 keV, and absorption edges around 0.7 keV and ~ 1 keV. These features strongly suggest the presence of "warm" (i.e. ionized) material in the central region of the two sources. Due to the insufficient photon statistics and to the lack of more advanced models for the spectral fitting, we are unable to determine accurately the geometry and physical state of the absorbing material. The physical implications of various viable spectral absorption or scattering scenarios for the nature of these objects and of the X-ray weak quasars in general, are discussed.

Accepted by Astron. Astr.

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Arakelian 564: An XMM-Newton view

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We report on two XMM-*Newton* observations of the bright narrow-line Seyfert 1 galaxy Ark 564 taken one year apart (2000 June and 2001 June). The 0.6–10 keV continuum is well described by a soft blackbody component ($kT \approx$ 140–150 eV) plus a steep power law ($\Gamma \approx$ 2.50–2.55). No significant spectral changes are observed between the two observations, although the X-ray flux in the second observation is $\approx$ 40–50 per cent lower. In both observations we detect a significant absorption edge at a rest-frame energy of ≈ 0.73 keV, corresponding to O VIII. The presence of the absorption feature is confirmed by a simultaneous *Chandra* grating observation in 2000 June, although the best-fitting edge threshold is at a slightly lower energy in the *Chandra* data, possibly because of a different parameterisation of the underlying X-ray continuum. We find tentative evidence for a broad iron emission line in the 2000 June observation. The results from an analysis of the power spectral density (PSD) function are also presented. The present XMM-*Newton* data support the idea that the PSD shows two breaks, although the location of the high-frequency break requires further constraints.

Accepted by MNRAS

E-mail contact: chris@astro.psu.edu, preprint available at astro-ph/0310278

X-raying Active Galaxies Found and Missed by the Sloan Digital Sky Survey

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Current X-ray observatories, archival X-ray data, and the Sloan Digital Sky Survey (SDSS) represent a powerful combination for addressing key questions about active galactic nuclei (AGN). We describe a few selected issues at the forefront of X-ray AGN research and the relevance of the SDSS to them. Bulk X-ray/SDSS AGN investigations, X-ray weak AGN, red AGN, hard X-ray selected AGN, high-redshift AGN demography, and future prospects are all briefly discussed.

To appear in AGN Physics with the Sloan Digital Sky Survey (July 2003; Princeton, NJ), eds. G.T. Richards and P.B. Hall

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preprint available at http://www.astro.psu.edu/users/niel/papers/papers.html

Volume-limited SDSS/FIRST quasars and the radio dichotomy

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Much evidence has been presented in favor of and against the existence of two distinct populations of quasars, radio-loud and radio-quiet. The SDSS differs from earlier optically selected quasar surveys in the large number of quasars and the targeting of FIRST radio source counterparts as quasar candidates. This allows a qualitatively different approach of constructing a series of samples at different redshifts which are volume-limited with respect to both radio and optical luminosity. This technique avoids any biases from the strong evolution of quasar counts with redshift and potential redshift-dependent selection effects. We find that optical and radio luminosities of quasars detected in both SDSS and FIRST are not well correlated within each redshift shell, although the fraction of radio detections among optically selected quasars remains roughly constant at 10% for $z \leq 3.2$. The distribution in the luminosity-luminosity plane does not appear to be strongly bimodal. The optical luminosity function is marginally flatter at higher radio luminosities.

To appear in ASP proceedings "AGN physics with the SDSS", Princeton 2003

E-mail contact: jester@fnal.gov,
preprint available at http://arxiv.org/abs/astro-ph/0310648

Emission and absorption in Narrow-Line Seyfert 1 Galaxies

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The emission and absorption attributes of the UV-blue nuclear spectra of the Narrow-Line Seyfert 1 (NLS1) galaxies are analyzed based on high quality archival HST observations. Measurements from composite spectra as well as from individual sources reveal differences from the more general AGN samples: NLS1s have steeper (redder) UV-blue continua. Objects with UV line absorption show redder spectra, suggesting that internal dust is important in modifying the continuum shapes. A strong relationship is found between the slopes of the power-laws that best fit the UV-blue continua and the luminosities: the more luminous sources have bluer SEDs. This trend is possibly attributed to a luminosity-dependent inner geometry of the obscuring (dusty) material.

To appear in "AGN Physics with the Sloan Digital Sky Survey", ed. G.T. Richards & P.B. Hall (ASP Conference Series)

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preprint available at http://xxx.lanl.gov/abs/astro-ph/0310623

The K-band Hubble diagram of sub-mm galaxies and hyperluminous galaxies

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We present the K-band Hubble diagrams ($K-z$ relations) of sub-mm-selected galaxies and hyperluminous galaxies (HLIRGs). We report the discovery of a remarkably tight $K-z$ relation of HLIRGs, indistinguishable from that of the most luminous radiogalaxies. Like radiogalaxies, the HLIRG K-z relation at $z \lesssim 3$ is consistent with a passively evolving $\sim 3L_*$ instantaneous starburst starting from a redshift of $z \sim 10$. In contrast, many sub-mm selected galaxies are $\gtrsim 2$ magnitudes fainter, and the population has a much larger dispersion. We argue that dust obscuration and/or a larger mass range may be responsible for this scatter. The galaxies so far proved to be hyperluminous may have been biased towards higher AGN bolometric contributions than sub-mm-selected galaxies due to the 60μm selection of some, so the location on the $K-z$ relation may be related to the presence of the most massive AGN. Alternatively, a particular host galaxy mass range may be responsible for both extreme star formation and the most massive active nuclei.

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preprint available at astro-ph/0310661

X-ray He-like ions diagnostics: New Computations for Photoionized Plasmas: I. preliminary considerations

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Using the new version of the photoionization code Titan designed for plane-parallel photoionized thick hot media, which is unprecedented from the point of view of line transfer, we have undertaken a systematic study of the influence of different parameters on the He-like and H-like emission of a medium photoionized by an X-ray source. We explain why in modelling the emitting medium it is important to solve in a self-consistent way the thermal and ionization equilibria and to take into account the interconnection between the different ions. We insist on the influence of the column density on the He-like ion emission, via stratification of ion species, temperature gradient, resonance trapping and continuum absorption, and we show that misleading conclusions can be deduced if it is neglected. In particular a given column density of an He-like ion can lead to a large range of total column densities and ionization parameters. We show also that there is a non-model-dependent relation between an ion column density and its corresponding temperature, and that the ion column density cannot exceed a maximum value for a given ionization parameter. We give the equivalent widths of the sum of the He-like triplets and the triplet intensity ratios G and R, for the most important He-like ions, for a range of density, column density, and ionization parameter, in the case of constant density media. We show in particular that the line intensities from a given ion can be accounted for, either by small values of both the column density and of the ionization parameter, or by large values of both quantities, and it is necessary to take into account several ions to disentangle these possibilities. We show also that a "pure recombination spectrum" almost never exists in a photoionized medium: either it is thin, and resonance lines are formed by radiative excitation, or it is thick, and free-bound absorption destroys the resonance photons as they undergo resonant diffusion. Consequently, the G ratio is much smaller than the pure recombination ratio for a small value of the total column density, and it exceeds the recombination ratio for large values of the total column density and of the ionization parameter.

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preprint available at astro-ph-0310705

Emission Line Properties of AGN from a post-COSTAR FOS HST Spectral Atlas

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We present consistent emission line measurements for active galactic nuclei, useful for reliable statistical studies of emission line properties. This paper joins a series including similar measurements of 993 spectra from the Large Bright Quasar Survey (Forster et al. 2001) and 174 spectra of AGN obtained from the Faint Object Spectrograph (FOS) on HST prior to the installation of COSTAR (Kuraszkiewicz et al. 2002). This time we concentrate on 220 spectra obtained with the FOS after the installation of COSTAR, completing the emission line analysis of all FOS archival spectra. We use the same automated

technique as in previous papers, which accounts for Galactic extinction, models blended optical and UV iron emission, includes Galactic and intrinsic absorption lines and models emission lines using multiple Gaussians. We present UV and optical emission line parameters (equivalent widths, fluxes, FWHM, line positions) for a large number (28) of emission lines including upper limits for undetected lines. Further scientific analyses will be presented in subsequent papers.

Accepted by ApJS.

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preprints available at http://hea-www.harvard.edu/~pgreen/HRCULES.html

RXTE and *SAX* Observations of MCG −5-23-16: Reflection From Distant Cold Material

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We examine the spectral variability of the Seyfert 1.9 galaxy MCG−5-23-16 using *RXTE* and *SAX* observations spanning 2 years from April 1996 to April 1998. During the first year the X-ray source brightens by a factor of $\sim 25\%$ on timescales of days to months. During this time, the reprocessed continuum emission seen with *RXTE* does not respond measurably to the continuum increase. However, by the end of the second year during the *SAX* epoch the X-ray source has faded again. This time, the reprocessed emission has also faded, indicating that the reprocessed flux has responded to the continuum. If these effects are caused by time delays due to the distance between the X-ray source and the reprocessing region, we derive a light crossing time of between ~ 1 light day and ~ 1.5 light years. This corresponds to a distance of 0.001 pc to 0.55 pc, which implies that the reprocessed emission originates between 3×10^{15} cm and 1.6×10^{18} cm from the X-ray source. In other words, the reprocessing in MCG−5-23-16 is *not* dominated by the inner regions of a standard accretion disk.

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preprint available at http://xxx.lanl.gov/abs/astro-ph/0310468

Transient Relativistically-Shifted Lines as a Probe of Black Hole Systems

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X-ray spectra of Seyfert galaxies have revealed a new type of X-ray spectral feature, one which appears to offer important new insight into the black hole system. *XMM* revealed several narrow emission lines redward of Fe Kα in NGC 3516. Since that discovery the phenomenon has been observed in other Seyfert galaxies, e.g. NGC 7314 and ESO 198-G24. We present new evidence for a redshifted Fe line in *XMM* spectra of Mrk 766. These data reveal the first evidence for a significant shift in the energy of such a line, occurring over a few tens of kiloseconds. This shift may be interpreted as deceleration of an ejected blob of gas traveling close to the escape velocity.

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Chandra X-ray Observations of NGC 4258: Iron Absorption Lines from the Nucleus

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We report sub-arcsecond resolution X-ray imaging spectroscopy of the low luminosity active galactic nucleus of NGC 4258 and its immediate surroundings with the Chandra X-ray Observatory. NGC 4258 was observed four times, with the first two observations separated by one month, followed over a year later by two consecutive observations. The spectrum of the nucleus is well described by a heavily absorbed ($N_{\rm H} \simeq 7 \times 10^{22}$ cm^{-2} , which did not change), hard X-ray power law of variable luminosity, plus a constant, thermal soft X-ray component. We do not detect an iron Kα emission line with the upper limit to the equivalent width of a narrow, neutral iron line ranging between 94 and 887 eV (90% confidence) for the different observations. During the

second observation on 2000-04-17, two narrow absorption features are seen with $> 99.5\%$ confidence at $\simeq 6.4$ keV and $\simeq 6.9$ keV, which we identify as resonant absorption lines of Fe XVIII – Fe XIX Kα and Fe XXVI Kα, respectively. In addition, the 6.9 keV absorption line is probably variable on a timescale of ~ 6000 sec. The absorption lines are analyzed through a curve of growth analysis, which allows the relationship between ionic column and kinematic temperature or velocity dispersion to be obtained for the observed equivalent widths. We discuss the properties of the absorbing gas for both photo and collisionally ionized models. Given that the maser disk is viewed at an inclination $i = 82°$, the gas responsible for the 6.9 keV absorption line may be in an inner disk, a disk-wind boundary layer or be thermal gas entrained at the base of the jet. The gas which gives rise to the photoelectric absorption may be the same as that which causes the 6.4 keV Fe Kα absorption provided that the gas has a bulk velocity dispersion of a few thousand km s^{-1}. This is the first detection of iron X-ray absorption lines in an extragalactic source with a nearly edge-on accretion disk, and this phenomenon is likely to be related to similar X-ray absorption lines in Galactic X-ray binaries with nearly edge-on accretion disks.

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preprint available at astro-ph/0310553

An XMM–Newton Study of the Hard X–ray Sky

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We report on the spectral properties of a sample of 90 hard X-ray selected serendipitous sources detected in 12 *XMM–Newton* observations with $1 \leq F_{2-10} \leq 80 \times 10^{-14}$ erg cm^{-2} s^{-1}. Approximately 40% of the sources are optically identified with $0.1 \leq z \leq 2$ and most of them are classified as broad line AGNs. A simple model consisting of power law modified by Galactic absorption offers an acceptable fit to $\sim 65\%$ of the source spectra. This fit yields an average photon index of $\langle\Gamma\rangle \approx 1.55$ over the whole sample. We also find that the mean slope of the QSOs in our sample turns out to remain nearly constant ($\langle\Gamma\rangle \approx 1.8$–$1.9$) between $0 \leq z \leq 2$, with no hints of particular trends emerging along z. An additional cold absorption component with $10^{21} \leq N_H \leq 10^{23}$ cm^{-2} is required in $\sim 30\%$ of the sources. Considering only subsamples that are complete in flux, we find that the observed fraction of absorbed sources (i.e. with $N_H \geq 10^{22}$ cm^{-2}) is $\sim 30\%$, with little evolution in the range $2 \leq F_{2-10} \leq 80 \times 10^{-14}$ erg cm^{-2} s^{-1}. Interestingly, this value is a factor ~ 2 lower than predicted by the synthesis models of the CXB. This finding, detected for the first time in this survey, therefore suggests that most of the heavily obscured objects which make up the bulk of the CXB will be found at lower fluxes ($F_{2-10} < 10^{-14}$ erg cm^{-2} s^{-1}). This mismatch together with other recent observational evidences which contrast with CXB model predictions suggest that one (or more) of the assumptions usually included in these models need to be revised

Accepted by A&A

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Mid–infrared emission of galactic nuclei: TIMMI2 versus ISO observations and models

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We investigate the mid–infrared radiation of galaxies that are powered by a starburst or by an AGN. For this end, we compare the spectra obtained at different spatial scales in a sample of infrared bright galaxies. ISO observations which include emission of the nucleus as well as most of the host galaxy are compared with TIMMI2 spectra of the nuclear region. We find that ISO spectra are generally dominated by strong PAH bands. However, this is no longer true when inspecting the mid–infrared emission of the pure nucleus. Here PAH emission is detected in starbursts whereas it is significantly reduced or completely absent in AGNs. A physical explanation of these new observational results is presented by examining the temperature fluctuation of a PAH after interaction with a photon. It turns out that the hardness of the radiation field is a key parameter for quantifying the photo–destruction of small grains. Our theoretical study predicts PAH evaporation in soft X–ray environments. Radiative transfer calculations of clumpy starbursts and AGN corroborate the observational fact that PAH emission is connected to starburst activity whereas PAHs are destroyed near an AGN. The radiative transfer models predict for starbursts a much larger

mid–infrared size than for AGN. This is confirmed by our TIMMI2 acquisition images: We find that the mid–infrared emission of Seyferts is dominated by a compact core while most of the starbursts are spatially resolved.

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preprint available as pdf file at:
http://www.eso.org/ rsiebenm/FTP/t2gal.pdf.gz
or at: http://it.arXiv.org/ps/astro-ph/0310546

Jobs

Postdoctoral Fellowship - AGN Jet Physics

Joint Center for Astrophysics, University of Maryland, Baltimore County, USA
Application deadline: December 31, 2003

The Joint Center for Astrophysics at the University of Maryland, Baltimore County, invites applications for a Postdoctoral Fellow position beginning in 2004. The successful applicant will work with Dr. Eric Perlman and collaborators on multi-waveband observations of AGN jets. Research work will include the reduction of data from the HST, Chandra, and the VLA, modeling of jet physics, as well as preparation of observing proposals and the implementation of observing programs.

The candidate should have experience with X-ray, optical and/or astronomical data analysis methods and analysis packages (e.g.,IRAF/PyRAF, FTOOLS, CIAO, XSPEC, AIPS), and should be proficient in scientific programming. The position requires a Ph.D. in Astronomy, Physics or a closely related field. The initial appointment will be for one year, with renewal for up to two more years possible subject to funding.

For full consideration completed applications should be received before **December 31, 2003**, although applications will be reviewed until the position is filled. Applicants should submit their CV, bibliography, statement of research interests, and the names and contact information for three references to:

Joint Center for Astrophysics
Physics Department
University of Maryland, Baltimore County
1000 Hilltop Circle
Baltimore, MD 21250
USA

Inquiries should be addressed to Dr. Eric Perlman at perlman@jca.umbc.edu or 410-455-1982. Information about the Joint Center for Astrophysics, a collaboration between UMBC and NASA's Goddard Space Flight Center, can be found at http://jca.umbc.edu. UMBC is an AA/EOE.

Note from editor:

Considering the closing date for this post, this advert will be run in the October, November & December issues of the newsletter (RJB).

Three Postdoctoral positions and one Ph.D position[1,2,3]

Structure and Radiation Processes of AGN through multi-frequency analysis
ENIGMA Network

Within the European Research Training Network ENIGMA on "Structure and Radiation Processes of AGN through multi-frequency analysis" we seek to fill three postdoctoral positions and one Ph.D position. They will be hosted by three of the ten European research institutions working within this project.

[1] **Osservatorio Astronomico di Torino, Via Osservatorio, Torino, Italy**
[2] **Perugia University Observatory, Via Bonfigli, 06126, Perugia, Italy**
[3] **Cork Institute of Technology, Dept. of Applied Physics & Instrumentation, Rossa Avenue, Bishoptown, Cork, Ireland**

The network has been established to carry out research in the following areas:

- Numerical simulations and analytical modeling of Blazar jets to study:
  particle acceleration and radiation mechanisms,
  magnetohydrodynamic flows,
  jet physics in Blazars.
- Multi-frequency observations of radio-loud AGN to study:
  radio/optical Intra-Day variability,
  relationships between structural and flux density variability,
  relations in different high-energy bands (X-ray, γ-rays, and VHE radiation with Cerenkov telescopes).
- Advanced statistical methods for time-series and applications to astrophysical models.
- Developing high-precision photometric routines in different waveband regimes.
- Developing reliable robotic systems for automated ground-based monitoring of AGN.

The postdocs and Ph.D students will work in their host team and within this active and interacting network of empirical and theoretical research. They are encouraged to spend part of their time at other institutes during their appointment. They will have access to unique observational facilities and will profit from a strong training programme involving hardware-related aspects, observational strategies in all waveband regimes, and theoretical research.

Questions regarding the research programme can be directed to the network coordinator, Stefan Wagner.

The four positions will become available from January 2004. The positions are available for two up to three years. Competitive salaries will be paid, differing according to local regulations. Additional support will be available for extended visits to other partner institutions within the network, network meetings and conferences.

According to the rules of the EC, the positions are open to young researchers, holding a passport of a member or associate state of the European Union. Further details are given by the regulations of the EC programme (http://www.cordis.lu/improving/networks/faq.htm# q5).

Applications should include a curriculum vitae, a publication list, a summary of current research interests as well as a list of topics of interest or institutes which they would prefer to join. Two letters of reference should also be arranged for. The review of applications will start in December 2003, and will continue until all positions are filled.

Material should be sent to Landessternwarte Heidelberg, S. Wagner, Königstuhl 12,69117 Heidelberg, Germany, swagner@lsw.uni-heidelberg.de.

E-mail contact: swagner@lsw.uni-heidelberg.de,
further information is available at http://www.lsw.uni-heidelberg.de/enigma.html