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# Interacting Binaries

An Electronic Newsletter

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**1 Editorial**

Dear IB friends,

we have introduced a new section, “As seen on astro-ph”, where we collect interesting papers that we came across on astro-ph, but did not receive an abstract by the authors. This new service takes just a very small amount of our time, but could possibly be useful – comments would be appreciated. Obviously, our selection is rather CV-oriented, volunteers collecting astro-ph numbers of interesting papers on neutron star and black hole binaries are welcome!

As always: happy reading,

*Boris Gänsicke & Jens Kube*

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## 2 Abstracts of refereed papers

### 1RXS J062518.2+733433: A new intermediate polar

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*Astronomy & Astrophysics, in press (astro-ph/0305270)*

We report the identification of the cataclysmic variable 1RXS J062518.2+733433 as an intermediate polar. The orbital period of the system is determined to be  $283.0 \pm 0.2$  min from the radial velocity variation of H $\alpha$ , measured in an extensive set of time-resolved spectroscopy. Differential optical photometry obtained over a base line of three weeks reveals the presence of coherent variability with a period of  $19.788 \pm 0.002$  min, which we suggest to be the white dwarf spin period. The power spectrum of our photometry also contains a strong signal near the spectroscopically determined orbital period. The emission lines in 1RXS J062518.2+733433 display a complex multicomponent structure. In the trailed spectrogram of HeI  $\lambda$  6678 we detect a narrow component with a radial velocity semi-amplitude of  $\simeq 140$  kms, consistent with a possible origin on the irradiated face of the secondary. The absence of eclipses gives an upper limit on the binary inclination of  $i \lesssim 60^\circ$ .

*Download/Website:* <http://arxiv.org/abs/astro-ph/0305270>

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### RX J0042.3+4115: a stellar mass black hole binary identified in M31

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*Astronomy & Astrophysics, in press (astro-ph/0304503)*

Four XMM-Newton X-ray observations of the central region of the Andromeda Galaxy (M31) have revealed an X-ray source that varies in luminosity over  $\sim 1-3 \cdot 10^{38}$  erg s<sup>-1</sup> between observations and also displays significant variability over time-scales of a few hundred seconds. The power density spectra of lightcurves obtained in the 0.3–10 keV energy band from the three EPIC instruments on board XMM-Newton are typical of disc-accreting X-ray binaries at low accretion rates, observed in neutron star binaries only at much lower luminosities ( $\sim 10^{36}$  erg s<sup>-1</sup>). However X-ray binaries with massive black hole primaries have exhibited such power spectra for luminosities  $> 10^{38}$  erg s<sup>-1</sup>. We discuss alternative possibilities where RX J0042.3+4115 may be a background AGN or foreground object in the field of view, but conclude that it is located within M31 and hence use the observed power spectra and X-ray luminosities to identify the primary as a black hole candidate.

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### Physical changes during Z-track movement in Sco X-1 on the flaring branch

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*Astronomy & Astrophysics, in press (astro-ph/0305466)*

We present results of a detailed study of X-ray flaring in the Z-track source Sco X-1 in a highly super-Eddington state made using high quality Rossi-XTE data from the PCA and HEXTE instruments. The emission model successfully used to explain the dipping LMXB, and other classes of LMXB in recent years, was applied to study the physical evolution along the Z-track which remains a major problem. This model consists of blackbody emission from the neutron star plus Comptonized emission from an extended accretion disk corona. As found in earlier work, major changes take place in the neutron star blackbody emission with kT increasing in flaring, and the blackbody radius  $R_{\text{BB}}$  increasing substantially to a maximum value of  $9.4 \pm 0.6$  km, consistent with the radius of the neutron star, after which  $R_{\text{BB}}$  decreases. Thus this result is a measurement of neutron star radius. The behaviour of Sco X-1 in flaring is compared with our previous results for the strong flaring that takes place in the bright dipping, flaring LMXB X 1624-490. Remarkably, during movement along the Normal Branch towards the apex with the Flaring Branch, the luminosities of both spectral components decrease, suggesting the possibility that  $\dot{M}$  may decrease on the Normal Branch, contrary to the widely-held view that  $\dot{M}$  increases monotonically along the Z-track. During flaring, we detect for the first time an increase of the Comptonization cut-off energy which may suggest heating of the ADC plasma by the neutron star flare. The energy of a broad Gaussian line at 6.4 keV does not change, but the intensity of the line increases in flaring suggesting either an increase in ADC size in flaring or the effects of irradiation by the neutron star.

*Download/Website:* <http://xxx.soton.ac.uk/abs/astro-ph/0305466>

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### Anomalous ultraviolet line flux ratios in the cataclysmic variables 1RXS J232953.9+062814, CE315, BZ UMa and EY Cyg observed with HST/STIS

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*Astrophysical Journal, in press (astro-ph/0305264)*

Brief HST/STIS spectroscopic snapshot exposures of the cataclysmic variables 1RXS J232953.9+062814, CE315, BZ UMa and EY Cyg reveal very large NV/CIV line flux ratios, similar to those observed in AE Aqr. Such anomalous line flux ratios have so far been observed in 10 systems, and presumably reflect a different composition of the accreted material compared to the majority of cataclysmic variables. We discuss the properties of this small sample in the context of the recent proposal by Schenker et al. (2002) that a significant fraction of the present-day population of cataclysmic variables may have passed through a phase of thermal time-scale mass transfer.

*Download/Website:* <http://arxiv.org/abs/astro-ph/0305264>

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### A new evolutionary channel for Type Ia supernovae

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*Monthly Notices of the Royal Astronomical Society, published (2003MNRAS.341L..35K, astro-ph/0303488)*

We show that long-period dwarf novae offer a promising route for making Type Ia supernovae. For typical dwarf nova duty cycles  $d \sim 0.1$  to a few times  $10^{-3}$  mass is accreted by the white dwarf (WD) mainly during dwarf nova outbursts at rates allowing steady nuclear burning of most of the accreted matter. Mass gains of up to  $\sim 0.4M_{\odot}$  are possible in this way. Although these are too small to allow a  $0.7M_{\odot}$  WD to reach the Chandrasekhar mass, they are sufficient if the WD grew to  $\gtrsim 1M_{\odot}$  in a previous episode of thermal-timescale mass transfer, i.e. for those long-period dwarf novae which descend from supersoft binaries. A further advantage of this picture is that the supernova always occurs in a binary of small secondary/primary mass ratio, with the secondary having very little remaining hydrogen. Both features greatly reduce the possibility of hydrogen contamination of the supernova ejecta.

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### CVcat: an interactive database on cataclysmic variables

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*Astronomy & Astrophysics, in press (astro-ph/0304517)*

CVcat is a database that contains published data on cataclysmic variables and related objects. Unlike in the existing online sources, the users are allowed to add data to the catalogue. The concept of an “open catalogue” approach is reviewed together with the experience from one year of public usage of CVcat. New concepts to be included in the upcoming AstroCat framework and the next CVcat implementation are presented. CVcat can be found at <http://www.cvcat.org>.

Download/Website: <http://arxiv.org/abs/astro-ph/0304517>

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### The Fe XXII I(11.92 Å)/I(11.77 Å) Density Diagnostic Applied to the Chandra High Energy Transmission Grating Spectrum of EX Hydrae

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*Astrophysical Journal Letters, in press (astro-ph/0304080)*

Using the Livermore X-ray Spectral Synthesizer, which calculates spectral models of highly charged ions based primarily on HULLAC atomic data, we investigate the temperature, density, and photoexcitation dependence of the  $I(11.92 \text{ \AA})/I(11.77 \text{ \AA})$  line ratio of Fe XXII. We find that this line ratio has a critical density  $n_c \approx 5 \times 10^{13} \text{ cm}^{-3}$ , is approximately 0.3 at low densities and 1.5 at high densities, and is very insensitive to temperature and photoexcitation, so is a useful density diagnostic for sources like magnetic cataclysmic variables in which the plasma densities are high and the efficacy of the He-like ion density diagnostic is compromised by the presence of a bright ultraviolet continuum. Applying this diagnostic to the *Chandra* High Energy Transmission Grating spectrum of the intermediate polar EX Hya, we find that the electron density of its  $T_e \approx 12 \text{ MK}$  plasma is  $n_e = 1.0_{-0.5}^{+2.0} \times 10^{14} \text{ cm}^{-3}$ , orders of magnitude greater than that typically observed in the Sun or other late-type stars.

Download/Website: <http://arXiv.org/abs/astro-ph/0304080>

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### The formation of the coronal flow/ADAF

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*Astronomy & Astrophysics, published (2003A&A...402.1013M)*

We develop a new method to describe the accretion flow in the corona above a thin disk around a black hole in vertical and radial extent. The model is based on the same physics as the earlier one-zone model, but now modified including inflow and outflow of mass, energy and angular momentum from and towards neighboring zones. We determine the radially extended coronal flow for different mass flow rates in the cool disk resulting in the truncation of the thin disk at different distance from the black hole. Our computations show how the accretion flow gradually changes to a pure vertically extended coronal or advection-dominated accretion flow (ADAF). Different regimes of solutions are discussed. For some cases wind loss causes an essential reduction of the mass flow.

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### The Origin of Soft X-rays in DQ Herculis

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*Astrophysical Journal, in press (astro-ph/0305132)*

DQ Herculis (Nova Herculis 1934) is a deeply eclipsing cataclysmic variable containing a magnetic white dwarf primary. The accretion disk is thought to block our line of sight to the white dwarf at all orbital phases due to its extreme inclination angle. Nevertheless, soft X-rays were detected from DQ Her with *ROSAT* PSPC. To probe the origin of these soft X-rays, we have performed *Chandra* ACIS observations. We confirm that DQ Her is an X-ray source. The bulk of the X-rays are from a point-like source and exhibit a shallow partial eclipse. We interpret this as due to scattering of the unseen central X-ray source, probably in an accretion disk wind. At the same time, we observe what appear to be weak extended X-ray features around DQ Her, which we interpret as an X-ray emitting knot in the nova shell.

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### Looking for Dust and Molecules in Nova V4743 Sagittarii

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*Astronomy & Astrophysics, published (2003A&A...400L...5N)*

We present 1.2 mm continuum images and spectral line observations of CO(1–0) and SiO(3–2) rotational transitions of the recent nova V4743 Sgr. The nova is detected at 1.2 mm showing a variable millimetre emission. Only upper limits of  $T_{\text{A}}^* = 0.06$  K for CO and  $T_{\text{A}}^* = 0.03$  K for SiO could be derived. We discuss the results in terms the nature of the millimetre emission favouring dust from a phase before the recent outburst as the likely radiating source. We also comment on the possibility of free-free emission from the ionised shell as the source of the measured millimetre radiation.

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## Ultraviolet Spectra of CV Accretion Disks with Non-Steady $T(r)$ Laws

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*Astrophysical Journal, in press (astro-ph/0305384)*

An extensive grid of synthetic mid- and far-ultraviolet spectra for accretion disks in cataclysmic variables has been presented by Wade and Hubeny (1998). In those models, the disk was assumed to be in steady-state, that is  $T_{\text{eff}}(r)$  is specified completely by the mass  $M_{\text{WD}}$  and radius  $R_{\text{WD}}$  of the accreting white dwarf star and the mass transfer rate  $\dot{M}$  which is constant throughout the disk. In these models,  $T_{\text{eff}}(r) \propto r^{-3/4}$  except as modified by a cutoff term near the white dwarf.

Actual disks may vary from the steady-state prescription for  $T_{\text{eff}}(r)$ , however, e.g. owing to outburst cycles in dwarf novae ( $\dot{M}$  not constant with radius) or irradiation (in which case  $T_{\text{eff}}$  in the outer disk is raised above  $T_{\text{steady}}$ ). To show how the spectra of such disks might differ from the steady case, we present a study of the ultraviolet (UV) spectra of models in which power-law temperature profiles  $T_{\text{eff}}(r) \propto r^{-\gamma}$  with  $\gamma < 3/4$  are specified. Otherwise, the construction of the models is the same as in the Wade & Hubeny grid, to allow comparison. We discuss both the UV spectral energy distributions and the appearance of the UV line spectra. We also briefly discuss the eclipse light curves of the non-standard models. Comparison of these models with UV observations of novalike variables suggests that better agreement may be possible with such modified  $T_{\text{eff}}(r)$  profiles.

*Download/Website:* <http://xxx.lanl.gov/abs/astro-ph/0305384>

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## On resonance line profiles predicted by radiation driven disk wind models.

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*Astrophysical Journal Letters, in press (astro-ph/0306098)*

We report on resonance line profiles predicted by radiation driven disk wind models which extend radially one order of magnitude farther out than our previous models. Our main result is that the inclusion of a disk wind at larger radii changes qualitatively and quantitatively the line profiles predicted by the models. Our new models predict line absorption that is significantly stronger than those predicted by old models. Some of the previous line profiles exhibit a doubled-humped structure near the line center which is now replaced by a more plausible single, blueshifted minimum. We emphasize that the improvements in the shape as well as the strength of the absorption were achieved without changing the gross properties of the wind. In particular, our new models do not predict a higher mass-loss rate than the previous models. The main changes in the line profiles are due to the fact that the ratio between the rotational velocity and poloidal velocity of the wind decreases downstream. The new line profiles reproduce well the line absorption of the nova-like variable, IX Vel, and promise to reproduce observations of other cataclysmic variables. This success of the radiation driven disk wind model provides an important link between outflows in OB stars and outflows in active galactic nuclei.

*Download/Website:* <http://arXiv.org/abs/astro-ph/0306098>

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### The emission distribution in RR Pictoris

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*MNRAS, in press (astro-ph/0302237)*

We present time-resolved optical spectroscopy of the old nova RR Pic. Two emission lines (H $\alpha$  and He I) are present in the observed part of the spectrum and both show strong variability. H $\alpha$  has been used for Doppler tomography in order to map the emission distribution in this system for the first time. The resulting map shows the emission from the disc as well as two additional emission sources on the leading and trailing side of the disc. Furthermore we find evidence for the presence of either a disc-overflow or an asymmetric outflow from the binary with velocities up to  $\pm 1200 \text{ km s}^{-1}$ . The origin of the outflow would be the emission source on the leading side of the accretion disc.

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### The age, life expectancy, and space density of Post Common Envelope Binaries

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*Astronomy & Astrophysics, in press (astro-ph/0305531)*

We present a sample of 30 well observed Post Common Envelope Binaries (PCEBs). Deriving the cooling age of the white dwarfs, we show that the PCEB population is dominated by young systems. Having calculated the orbital evolution of the systems under the assumption of two different prescriptions for the angular momentum loss, we find that most of the systems have not yet completed a significant fraction of their PCEB life time. We therefore predict the existence of a large population of old PCEBs containing cold white dwarfs ( $T_{\text{eff}} \lesssim 15000 \text{ K}$ ). Our calculations show that nearly half of the PCEBs in our sample will evolve into a semi-detached configuration and start mass transfer in less than the Hubble-time. These systems are thus representative for progenitors of the current CV population. Only one of them (V471 Tau) will evolve into a long-period ( $P_{\text{orb}} \gtrsim 4 \text{ h}$ ) CV, and a significant fraction of the systems will start mass transfer in the period gap. Having estimated the distances of the PCEBs in the sample, we derive a space density of  $\rho_{\text{PCEB}} \sim 6 - 30 \times 10^{-6} \text{ pc}^{-3}$ , depending on the assumed angular momentum loss prescription. Taking into account the evolutionary time scales we compute a lower limit for the CV space density, predicted by the currently known PCEB population of  $\rho_{\text{CV}} \gtrsim 10^{-5} \text{ pc}^{-3}$ . Finally, we discuss possible observational selection effects and conclude that the observed PCEB population is probably highly incomplete.

Download/Website: <http://de.arXiv.org/abs/astro-ph/0305531>

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### Discovery of the eclipse in the symbiotic binary Z Andromedae

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*Astronomy & Astrophysics, published (2003A&A...401L..17S)*

Our photometric observations of the symbiotic binary Z And during its recent (2000 – 2003) active phase revealed a minimum in the *U*, *B* and *V* light curves (LC) at the position of the inferior conjunction of its cool component (the orbital phase  $\phi = 0$ ). This fact and the behaviour of colour indices suggest that the minimum was due to the eclipse of the active hot object by the red giant. Physically plausible fit of the eclipse profile and a precise analysis

of the spectral energy distribution (SED) in the ultraviolet continuum suggest a disk-like structure for the hot object during active phases. The present knowledge of fundamental parameters of the system limits the orbital inclination  $i$  to  $76^\circ - 90^\circ$ . The presence of the Rayleigh attenuated far-UV continuum at  $\phi \sim 0$  during quiescent phase confirms the very high inclination of the Z And orbit.

*Download/Website:* <http://arXiv.org/list/astro-ph/0304046>

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### The near-synchronous polar V1432 Aql (RX J1940.1–1025): Accretion geometry and synchronization time scale

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*Astronomy & Astrophysics, in press (astro-ph/0306072)*

The magnetic Cataclysmic Variable (mCV) V1432 Aql (RX J1940.1–1025) belongs to the four-member subclass of near-synchronous polars with a slight non-synchronism ( $< 2\%$ ) between the spin period of the white dwarf and the binary period. In these systems the accretion geometry changes periodically with phase of the beat cycle. We present the application of a dipole accretion model for near-synchronous systems developed by Geckeler & Staubert (1997a) to extended optical and X-ray data. We detect a significant secular change of the white dwarf spin period in V1432 Aql of  $dP_{\text{spin}}/dt = -5.4^{+3.7}_{-3.2} \cdot 10^{-9}$  s/s from the optical data set alone. This corresponds to a synchronization time scale  $\tau_{\text{sync}} = 199^{+441}_{-75}$  yr, comparable to the time scale of 170 yr for V1500 Cyg. The synchronization time scale in V1432 Aql is in excellent agreement with the theoretical prediction from the dominating magnetic torque in near-synchronous systems. We also present period analyses of optical CCD photometry and RXTE X-ray data, which argue against the existence of a 4000 s period and an interpretation of V1432 Aql as an intermediate polar. The dipole accretion model also allows to constrain the relevant parameters of the accretion geometry in this system: the optical data allow an estimate of the dimensionless parameter  $(R'_{10}/R_{\text{wd}})^{1/2} \sin \beta = 3.6^{+2.7}_{-1.1}$ , with a lower limit for the threading radius of  $R'_{10} > 10R_{\text{wd}}$  (68% confidence).

*Download/Website:* <http://www.uni-tuebingen.de/publications>

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### 1RXSJ062518.2+733433: A bright, soft intermediate polar

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*Astronomy & Astrophysics, in press (astro-ph/0304323)*

We present the results of 50 hours time-resolved *R*-band photometry of the ROSAT all-sky survey source 1RXSJ062518.2+733433. The source was identified by Wei et al. (1999) as a cataclysmic variable. Our photometry, performed in 10 nights between February 11, 2003, and March 21, 2003, reveals two stable periodicities at 19.7874 and 283.118 min, which are identified as probable spin and orbital periods of the binary. We therefore classify 1RXSJ062518.2+733433 as an intermediate polar. Analysis of the RASS X-ray observations reveal a variability of

100% in the X-ray flux and a likely soft X-ray excess. The new IP thus joins the rare group of soft IPs with only four members so far.

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### The Long Aftermath of Superoutbursts: STIS Results on AL Comae 5.5 Years Past Outburst

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*Astronomical Journal, in press*

The Space Telescope Imaging Spectrograph (STIS) was used to obtain the ultraviolet spectrum of AL Com 5.5 yrs past its 1995 April superoutburst. The spectrum can be fit by a model of a  $\log g=8\pm 0.5$  white dwarf with a temperature of  $16,300\pm 1000\text{K}$ . Surprisingly, the flux distribution is exactly the same as the Faint Object Spectrograph data obtained 4.5 yrs earlier, but the UV fluxes are a factor of two lower than the previous measurement, while the optical fluxes remained the same. The implication could be that the temperature of the UV component has remained very similar but the size of the emitting area has decreased by  $\sim 30\%$ . Alternatively, there could be multiple components contributing in the UV, with corresponding changes in temperature and size that produce a similar flux distribution at the two epochs.

*Download/Website:* <http://www.astro.washington.edu/szkody/papers/list.html>

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### Cataclysmic Variables from SDSS II. The Second Year

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*Astronomical Journal, in press (Astro-PH)*

The first full year of operation following the commissioning year of the Sloan Digital Sky Survey has revealed a wide variety of newly discovered cataclysmic variables. We show the SDSS spectra of 42 cataclysmic variables observed in 2002, of which 35 are new classifications, 4 are known dwarf novae (CT Hya, RZ Leo, T Leo and BZ UMa), 1 is a known CV identified from a previous quasar survey (Aqr1) and 2 are known ROSAT or FIRST discovered CVs (RX J09445+0357, FIRST J102347.6+003841). The SDSS positions, colors and spectra of all 42 systems are presented. In addition, the results of follow-up studies of several of these objects identify the orbital periods, velocity curves and polarization that provide the system geometry and accretion properties. While most of the SDSS discovered systems are faint ( $> 18\text{th mag}$ ) with low accretion rates (as implied from their spectral characteristics), there are also a few bright objects which may have escaped previous surveys due to changes in the mass transfer rate.

*Download/Website:* <http://www.astro.washington.edu/szkody/papers/list.html>

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### Simultaneous ASCA and HST/GHRS observations of Cygnus X-2/V1341 Cygni

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*Publications of the Astronomical Society of the Pacific, in press (astro-ph/0305459)*

We present results from ultraviolet and X-ray observations of the low mass X-ray binary Cygnus X-2. The simultaneous HST/GHRS and ASCA observations took place during the low state of an 82-day cycle. We compare our observations as well as archival IUE and RXTE data with models that predict ultraviolet and optical continuum emission from an X-ray heated disk and a Roche-lobe-filling star. The model predictions are consistent with observed optical, ultraviolet, and X-ray variations over both orbital and long-term periods. The X-ray spectral state, the luminosities implied by fits to the X-ray data, the ultraviolet continuum and line fluxes, and the mass accretion rates obtained from fits to the ultraviolet continuum are consistent with location of our observations on the normal and horizontal branches of the Z-shaped X-ray color-color diagram. A combination of changes to mass accretion rate and obstruction by a warped disk can be invoked as a possible explanation for the motion of the “Z” in the color-color plane.

The GHRS/G160M measurements concentrated on NV ( $\lambda$ 1238.8;  $\lambda$ 1242.8) and HeII ( $\lambda$ 1640.5). The low-resolution (GHRS/G140L) observations captured SiIV ( $\lambda$  1393.8;  $\lambda$ 1402.8), NIV ( $\lambda$  1486.5), and CIV ( $\lambda$  1548); absorption lines detected in the spectra are interstellar. Although the relative line fluxes are consistent with emission from an X-ray heated accretion disk corona, predictions from models of line emission from simple disks do not fit the observed emission line profiles. The lack of double peaks suggests that most of the line emission is from the surface of the companion and the radial velocities (80-130 km s<sup>-1</sup>) are consistent with emission from the optical star at the orbital phase (0.70-0.74) of our observations.

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### The X-ray and extreme-ultraviolet flux evolution of SS Cygni throughout outburst

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*Monthly Notices of the Royal Astronomical Society, in press*

We present the most complete multiwavelength coverage of any dwarf nova outburst: simultaneous optical, *Extreme Ultraviolet Explorer*, and *Rossi X-ray Timing Explorer* observations of SS Cygni throughout a narrow asymmetric outburst. Our data show that the high-energy outburst begins in the X-ray waveband 0.9–1.4 d after the beginning of the optical rise and 0.6 d before the extreme-ultraviolet rise. The X-ray flux drops suddenly, immediately before the extreme-ultraviolet flux rise, supporting the view that both components arise in the boundary layer between the accretion disc and white dwarf surface. The early rise of the X-ray flux shows the propagation time of the outburst heating wave may have been previously overestimated.

The transitions between X-ray and extreme-ultraviolet dominated emission are accompanied by intense variability in the X-ray flux, with timescales of minutes. As detailed by Mauche & Robinson, dwarf nova oscillations are detected throughout the extreme-ultraviolet outburst, but we find they are absent from the X-ray lightcurve.

X-ray and extreme-ultraviolet luminosities imply accretion rates of  $3 \times 10^{15}$  g s<sup>-1</sup> in quiescence,  $1 \times 10^{16}$  g s<sup>-1</sup> when the boundary layer becomes optically thick, and  $\sim 10^{18}$  g s<sup>-1</sup> at the peak of the outburst. The quiescent accretion rate

is two and a half orders of magnitude higher than predicted by the standard disc instability model, and we suggest this may be because the inner accretion disc in SS Cyg is in a permanent outburst state.

*Download/Website:* <http://www.astro.le.ac.uk/~pjlw/sscyg.ps>

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### On the detection of pre-low-mass X-ray binaries

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*Monthly Notices of the Royal Astronomical Society, in press (astro-ph/0304548)*

We explore the population of candidate pre-low-mass X-ray binaries in which a neutron star accretes mass from the wind of a low-mass companion (mass  $\leq 2M_{\odot}$ ) in the framework of a binary population synthesis study. The simulated accretion-luminosity distribution shows a primary peak close to  $10^{31}$  erg/s and a secondary peak near  $10^{28}$  erg/s. The relative contribution of the two peaks depends primarily on the magnitude of the kick velocity imparted to the neutron star at birth. The secondary peak is negligible for average kick velocities larger than  $\sim 200$  km/s, but becomes dominant for average kick velocities smaller than  $\sim 50$  km/s. Regardless of the relative contributions of the two peaks, our calculations suggest that pre-low-mass X-ray binaries may provide a non-negligible contribution to the population of discrete low-luminosity X-ray sources in the Galaxy.

*Download/Website:* <http://phys-ftp.open.ac.uk/pub/publications/S20034321765826/prelmbx.ps.gz>

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### Investigating the Sloan Digital Sky Survey Cataclysmic Variable SDSS J132723.39+652854.2

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*Publications of the Astronomical Society of the Pacific, in press (astro-ph/0305607)*

Photometric and spectroscopic observations reveal the Sloan Digital Sky Survey (SDSS) cataclysmic variable (CV) SDSS J132723.39+652854.2 to be a likely SW Sex star with an orbital period of  $P = 3.28$  hours. The SDSS spectrum shows strong He I, He II and Balmer emission lines. Time resolved spectra acquired at Apache Point Observatory reveal absorption-line structure within the emission lines near phase 0.5. Photometric data obtained at Manastash Ridge Observatory using Harris V and B filters reveal a high inclination system ( $i = 80$  degrees) with deep ( $\sim 2$  mag) eclipses. The orbital period and the spectral variations favor an SW Sex interpretation.

*Download/Website:* <http://www.astro.washington.edu/szkody/papers/list.html>

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### 3 Other abstracts

#### Spectroscopy, Photometry and Micro-arcsec Astrometry of Binaries with the GAIA Space Mission and with the RAVE Experiment

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*RMexAA, in press, proc. of the IAU Coll. 191, "Environments & Evolution of Double & Multiple Stars", Merida, Mexico, February 2003 (astro-ph/0306019)*

GAIA astrometric mission of ESA will be very efficient in discovering binary and multiple stars with any orbital period, from minutes to millions of years. Main parameters of the revised mission design are presented. Next we estimate the fraction of binary stars discovered by means of astrometry, photometry and on-board spectroscopy. Finally we summarize observations that confirm the ability to measure physical parameters like masses, radii and spectroscopic distance from GAIA data alone. GAIA will fly only in 2010, but the Radial velocity experiment (RAVE) has started this year. We show that its spectroscopic observations have the capacity to discover a large fraction of so far unknown binary systems.

*Download/Website:* <http://arxiv.org/abs/astro-ph/0306019>

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### 4 As seen on astro-ph

astro-ph/0303022: *Spectroscopic Observations of Twenty-one Faint Cataclysmic Variables Candidates* by E. Mason, S. B. Howell

astro-ph/0303144: *Discovery of variable circular polarization from the remnant of Nova Chamaeleontis 1953 (RR Cha)* by P. Rodriguez-Gil et al.

astro-ph/0303224: *Period change of Superhumps in the WZ Sge-Type Dwarf Nova, HV Virginis* by R. Ishioka et al.

astro-ph/0303263: *Bowen Fluorescence from the Companion Star in X1822-371* by J. Casares et al.

astro-ph/0303300: *The Galactic Population of Low- and Intermediate-Mass X-ray Binaries* by E. Pfahl et al.

astro-ph/0303537: *WZ Sge: FUSE Spectroscopy of the 2001 Outburst* by Knox S. Long et al.

astro-ph/0304002: *High-speed photometry of the Recurrent Nova IM Normae* by Patrick A. Woudt et al.

astro-ph/0304265: *New results on GP Com* by L. Morales-Rueda et al.

astro-ph/0304328: *Hubble Space Telescope Observations of the Nova-Like Cataclysmic Variable V348 Puppis* by C.S. Froning et al.

astro-ph/0304479: *XMM-Newton observations of Nova LMC 2000* by J. Greiner et al.

astro-ph/0305283: *Spin up in RX J0806+15 - the shortest period binary* by Pasi Hakala et al.

astro-ph/0305307: *A XMM-Newton observation of Nova LMC 1995, a bright supersoft X-ray source* by Marina Orion et al.

astro-ph/0305365: *Extending emission line Doppler tomography ; mapping modulated line flux* by D. Steeghs

astro-ph/0306080: *The Thermal State of Accreting White Dwarfs Undergoing Classical Novae* by Dean M. Townsley, Lars Bildsten

astro-ph/0306085: *Dwarf Nova Oscillations and Quasi-Periodic Oscillations in Cataclysmic Variables: III. A New Kind of Dwarf Nova Oscillation, and Further Examples of the Similarities to X-Ray Binaries* by Brian Warner et al.

## 5 Jobs and positions

### Lectureship in Astronomy and Astrophysics

Department of Physics, University of Warwick

Applications are invited for a lectureship in astronomy and astrophysics as part of a new initiative to broaden the research base of the Department of Physics at Warwick. Prof Marsh and Dr Gänsicke will be in post by the autumn of 2003. In addition to this lectureship, another permanent post will be filled by Oct 2005. The post is intended to broaden the range of research of the new group, while maintaining a cohesive research direction.

Prof Marsh's current work centres around ULTRACAM, a novel high-speed multi-band CCD camera which is suited to a wide range of time-variable astrophysics. This has been used on the 4.2m WHT and will be used extensively on the new 2.3m Greek telescope, ARISTARCHOS. Current projects with ULTRACAM include studies of cataclysmic variable stars, black-hole binaries and pulsars, precise timing and light-curve modelling of detached white dwarf binaries, and asteroseismological studies. Prof. Marsh also leads research upon binary evolution from an observational perspective through studies of white dwarf and subdwarf binary stars which have the advantage of well-understood selection effects. These stars are potential Type Ia supernova progenitors and sources for the LISA gravitational wave detector. Other interests include population studies of cataclysmic variable stars, indirect imaging (tomography and eclipse mapping) of accreting binary stars, and time-series analysis.

Dr Gänsicke leads a major project to characterise the population of cataclysmic variable stars and their progenitors. This programme involves the identification of such binaries using novel selection methods, intense optical follow-up observations, and will eventually result in a statistically sound sample of these stars that can then be used to test and improve our understanding of close binary evolution. Additional support for this project comes from a wide-ranging HST ultraviolet spectroscopic survey of cataclysmic variables, also under the leadership of Dr Gänsicke. He is also studying the properties of accreting white dwarfs, primarily using HST and FUSE observations. These analyses are closely linked into theoretical work on stellar atmospheres, including explorative models for neutron stars and irradiation-heated white dwarfs. Another strand of Dr Gänsicke's research is the analysis and interpretation of multi-wavelength observations of supersoft X-ray binaries, obtained with the VLT, XMM, and the HST.

Application packs are available from the Personnel Office on 024 7652 3685 (24 hour answerphone) or by email to [Recruit@warwick.ac.uk](mailto:Recruit@warwick.ac.uk). An application form MUST be completed if you wish to be considered for this post. Closing date for applications is 11 July 2003. Please return the original application form together with a PHOTOCOPY and TWO copies of any supporting information, in a sealed envelope marked clearly with the Reference number 42/A/02 to:

The Personnel Office  
University of Warwick  
Coventry CV4 7AL  
UK

Informal enquiries may be made to [Tom.Marsh@Warwick.ac.uk](mailto:Tom.Marsh@Warwick.ac.uk)

### Postdoctoral Fellow

Space Telescope Science Institute

Applications are invited for a postdoctoral research position at the Space Telescope Science Institute to work with Dr. Knox Long on space-based (FUSE/HST/Chandra) observations of cataclysmic variables and supernova remnants. The successful applicant will be familiar with one or both of these research areas, and should also be accomplished in one of the following technical areas: calibration and analysis of UV (HST or FUSE) spectra, calibration and analysis of X-ray CCD or grating spectra, modeling of the UV spectra of cataclysmic variables or related objects, or hydrodynamic or shock modeling of SN shocks. Familiarity with one or more high-level software languages and astronomical data analysis packages is highly desirable.

Qualified applicants must have a PhD or equivalent degree by the date of appointment. There are no restrictions on citizenship. This position is subject to the availability of funding and on performance.

Applicants should send a cover letter specifying the position they are applying for and the area of primary interest to the address below, and attach a curriculum vitae, a publication list, a description of research interests, and a proposal for relevant research. They should also arrange for three letters of recommendation to be sent directly to the same address. Completed applications received by June 21, 2003 are assured full consideration.

STScI, located on Johns Hopkins University Campus in Baltimore, Maryland, offers an excellent benefit package, competitive salaries, and a stimulating work environment. Women and members of minority groups are strongly encouraged to apply. EOE/AA/M/F/D/V.

Space Telescope Science Institute

ATTN: Human Resources

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