The Magellanic Clouds Newsletter
An electronic exchange of Magellanic Clouds information

Edited by: Eva K. Grebel, You-Hua Chu, and Dominik J. Bomans
mcnews@astro.uiuc.edu
http://www.astro.uiuc.edu/mcnews/MCNews.html
http://www.astro.uni-bonn.de/~mcnews/

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News and Views

Dear Colleagues,

The First Announcement of IAU Symposium 190 on New Views of the Magellanic Clouds, which will be held on July 13 to 17 in Victoria, Canada, is available now. It will be sent by separate e-mail to all subscribers of the Magellanic Clouds Newsletter. Please forward the announcement to other astronomers who might be interested in the symposium.

If you are interested in attending the symposium please respond to the Indication-of-Interest Form at the end of the first announcement before December 15. Speakers will be selected based on the proposed contributions in this form.

A dedicated web site for IAU Symp. 190 has been set up by David Bohlender at the DAO. Please check it out at http://cadcwww.hia.nrc.ca/iau190/iau190.html for further information.

We are looking forward to seeing you in Victoria!

The Editors

Abstracts of Refereed Papers

Mid-IR mapping of the region of N 4 in the Large Magellanic Cloud with ISOCAM

A. Contursi\textsuperscript{1}, J. Lequeux\textsuperscript{1}, M. Hanus\textsuperscript{1} et al.

\textsuperscript{1} Observatoire de Paris, 61 Av. de l’Observatoire, 75014 Paris, France

We present images of the N 4 region in the Large Magellanic Cloud obtained with ISOCAM on board ISO through broad band filters centered at 6.75 and 15 \( \mu m \). Far from the three H\,\textsc{ii} regions contained in the map, the emission at both wavelengths is due to the Unidentified Infrared Bands and associated continuum and originates in the external layers of a molecular cloud complex. The ratio between the intensities at 15 and 6.75 \( \mu m \) is \( \lesssim 0.6-0.7 \), comparable to the 0.55–0.85 ratio found in our Galaxy. Closer to the H\,\textsc{ii} regions, this ratio increases when the ultraviolet radiation density reaches \( \lesssim 10^3 \) times the radiation density near the Sun, due to the contribution of very small grains to the flux near 15 \( \mu m \). The emission at both wavelengths is maximum in the direction of an interface between the main H\,\textsc{ii} region N 4A and the molecular cloud, a region very similar to the classical interface of M17 in our Galaxy. We have detected at both mid-IR wavelengths the emission of a M supergiant present in the field.

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Spatially Resolved STIS Spectroscopy of SN 1987A: Evidence for Shock Interaction with Circumstellar Gas

G. Sonneborn\textsuperscript{1}, C.S.J. Pun\textsuperscript{1,2}, R.A. Kimble\textsuperscript{1,3}, T.R. Gull\textsuperscript{1,3}, P. Lundqvist\textsuperscript{4}, R. McCray\textsuperscript{5}, P. Plait\textsuperscript{6}, A. Boggess\textsuperscript{3,7}, C.W. Bowers\textsuperscript{1,3}, A.C. Danks\textsuperscript{3,8}, J. Grady\textsuperscript{9}, S.R. Heap\textsuperscript{1,3}, S. Kraemer\textsuperscript{3,10}, D. Lindler\textsuperscript{6}, J. Loiacono\textsuperscript{9}, S.P. Maran\textsuperscript{3,11}, H.W. Moos\textsuperscript{3,12}, and B.E. Woodgate\textsuperscript{1,3}

\textsuperscript{1} Laboratory for Astronomy and Solar Physics, Code 681, NASA Goddard Space Flight Center, Greenbelt, MD 20771, USA
\textsuperscript{2} National Optical Astronomy Observatories, Tucson, AZ 85726, USA
\textsuperscript{3} Space Telescope Imaging Spectrograph Investigation Definition Team, USA
\textsuperscript{4} Stockholm Observatory, S-133 36, Saltsjöbaden, Sweden
\textsuperscript{5} JILA, University of Colorado, Boulder, CO 80309, USA
\textsuperscript{6} Applied Computer Concepts, Code 681, NASA Goddard Space Flight Center, Greenbelt, MD 20771, USA
\textsuperscript{7} 2420 Balsam Drive, Boulder, CO 80304, USA
\textsuperscript{8} Hughes STX, Code 681, NASA Goddard Space Flight Center, Greenbelt, MD 20771, USA
\textsuperscript{9} Laboratory for Astronomy and Solar Physics, Code 680.1, NASA Goddard Space Flight Center, Greenbelt, MD 20771, USA
\textsuperscript{10} Catholic University of America, Code 681, NASA Goddard Space Flight Center, Greenbelt, MD 20771, USA
\textsuperscript{11} Space Sciences Directorate, Code 600, NASA Goddard Space Flight Center, Greenbelt, MD 20771, USA
\textsuperscript{12} Dept. of Physics and Astronomy, Johns Hopkins University, Baltimore, MD 21218, USA
Visual and ultraviolet spatially resolved (~0.1") spectra of SN 1987A obtained on days 3715 and 3743 with the Space Telescope Imaging Spectrograph on the Hubble Space Telescope show that the high-velocity SN debris is colliding with circumstellar gas. Very broad Lyα emission with velocities extending to υ ≈ ±20,000 km s⁻¹ originates inside the inner circumstellar ring and appears to fill most of the surface area within ρ/67 ± 0.03 (0.14 pc at a distance of 50 kpc) of the ring's center. The observed Lyα flux from the shocked ejecta is (1.85 ± 0.53) × 10⁻¹³ erg cm⁻² s⁻¹ and (1.25 ± 0.51) × 10⁻¹² erg cm⁻² s⁻¹ after correcting for extinction. A spatially unresolved blue-shifted emission feature was discovered in Hα (and other lines) on the inner ring at p.a. 31° ± 8°. The Hα emission extends to ~250 km s⁻¹ with no corresponding red-shifted emission. This highly localized interaction appears to be the initial contact of the supernova blast wave with an inward protrusion of the inner ring. The broad Lyα emission and the ‘hot spot’ are separate interaction phenomena associated with the reverse and forward shocks, respectively. We also find that the size of the inner ring in forbidden lines of oxygen has a dependence on ionization potential, in agreement with photoionization models of the ring.

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Quantitative spectroscopy of Wolf-Rayet stars in HD 97950 and R136a - the cores of giant H II regions

P.A. Crowther & Luc Dessart

Department of Physics and Astronomy, University College London, Gower Street, London, WC1E 6BT, UK

We present quantitative analyses of Wolf-Rayet stars in the cores of two giant H II regions - HD 97950 in NGC 3603 and R136a in 30 Doradus - based on archive HST spectroscopy. We confirm previous WN6h+abs classifications for components A1, B and C in HD 97950, while classifications for R136a1-3 are revised from O3If/WN6 to WN5h. From detailed non-LTE analyses, we find all stars exhibit products of CNO-processed material at their surface since they are rich in both helium (H/He~3-6) and nitrogen [N/He~0.002-0.006]. Their luminosities, log (L/L☉)=6.0-6.3, are amongst the highest known for Wolf-Rayet stars. Consequently they are very massive stars (M≥100M☉) at a relatively young age (~2 Myr), reminiscent of the WNL stars in the Carina Nebula.

We obtain a revised distance modulus of 15.03 mag (=10.1 kpc) to NGC 3603 based on available photometry, an updated Mv-calibration for early O stars and a reddening of E(B-V)≈1.23 mag. From a census of the massive stellar content of the two central clusters, we evaluate the contribution made by Wolf-Rayet stars to the total Lyman continuum ionizing flux and kinetic energy released into the ISM. We discuss how simple calibrations can be used to estimate stellar luminosities, ionizing fluxes and mass-loss rates of luminous OB stars. Wolf-Rayet stars provide ~20 per cent of the total ionizing flux (~1.3×10³² Ly photons s⁻¹) of their cores (r≤0.5 pc) and ~60 per cent of the total kinetic energy injected into the ISM (5–6×10³⁸ erg s⁻¹), despite representing only 10 per cent of the massive stellar population. For the larger R136 cluster in 30 Doradus (r≤10 pc), 119 massive stars provide a total ionizing flux of 4×10³³ Ly photons s⁻¹ and release a total kinetic energy of 1.6×10³⁹ erg s⁻¹ into the ISM, the latter being dominated by nine WR (42 per cent) and six O3If/WN (28 per cent) stars.


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Photometric variability of the SMC W-R binary HD 5980

C. Sterken¹ and J. Breysacher²

¹ University of Brussels (VUB), Pleinlaan 2, 1050 Brussels, Belgium
² European Southern Observatory, Karl-Schwarzschildstraße 2, D-85748 Garching b. München, Germany

We present the results of a photometric monitoring campaign of the W-R binary HD 5980 conducted in November–December 1995, 16 months after the LBV-like outburst of one of the components of the system. On the basis of almost 800 y-band measurements, an improved orbital ephemeris is derived. We also report the discovery of a coherent 6h periodic oscillation visible in the Strömgren b and y bands with amplitudes ~ 0.0025. This short period may be related to pulsations of the primary or secondary component.

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Long-term visual monitoring of southern luminous variables
and a comparison with photoelectric photometry

A. Jones¹ and C. Sterken²

¹ Carter Observatory, P.O. Box 2909, Wellington, New Zealand
² University of Brussels (VUB), Pleinlaan 2, 1050 Brussels, Belgium

We present 9700 visual-magnitude estimates of key objects among southern massive stars, viz. the LBVs/hypergiants HD 6884 (R 40), η Car, AG Car, HDE 326823, HDE 269006 (R 71), HD 33579, HDE 269128 and WR stars HD 5980 and WR 40. The visual estimates are complemented with photoelectric light curves obtained over the last two decades in the framework of the Long-Term Photometry of Variables project. Several of our data sets have been searched for periodicities, and this aspect of the data is commented in graphical form (by means of amplitude spectra) and, where necessary, with additional notes. The visual and photoelectric data demonstrate that the systematic monitoring of luminous massive stars is scientifically very rewarding.

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Mass Segregation in Young LMC Clusters I. NGC 2157

Philippe Fischer\textsuperscript{1}, Carlton Pryor\textsuperscript{2}, Stephen Murray\textsuperscript{3}, Mario Mateo\textsuperscript{1}, and Tom Richtler\textsuperscript{4}

\textsuperscript{1} University of Michigan, Dept. of Astronomy, 821 Dennison Bldg., Ann Arbor, MI 48109-1090, USA
\textsuperscript{2} Rutgers University, Dept. of Physics & Astronomy, PO Box 849, Piscataway, NJ 08855-0845, USA
\textsuperscript{3} Lawrence Livermore Nat. Lab., L-58, PO Box 808, Livermore, CA 94550, USA
\textsuperscript{4} Sternwarte der Universität Bonn, Auf dem Hügel 71, D-53121 Bonn, Germany

We have carried out WFPC2 V- and I-band imaging of the young LMC cluster NGC 2157. Construction of a color-magnitude diagram and isochrone fitting yields an age of $\tau = 10^8$ yrs, a reddening $E(B-V) = 0.1$ and a distance modulus of 18.4 mag. Our data covers the mass range $0.75 \, M_\odot \leq m \leq 5.1 \, M_\odot$. We find that the cluster mass function changes significantly from the inner regions to the outer regions, becoming steeper (larger number of low mass stars relative to high mass stars) at larger radii.

The age of NGC 2157 is comparable to its two-body relaxation timescale only in the cluster core. The observed steepening of the mass function at larger radii is therefore most likely an initial condition of the cluster stars. Such initial conditions are predicted in models of cluster star formation in which dissipative processes act more strongly upon more massive stars.

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Stellar Populations in Three Outer Fields of the LMC

Marla C. Geha\textsuperscript{1}, Jon A. Holtzman\textsuperscript{1}, J.R. Mould\textsuperscript{2}, J.S. Gallagher\textsuperscript{3}, A.M. Watson\textsuperscript{4}, A.A. Cole\textsuperscript{3}, C.J. Grillmair\textsuperscript{5}, K.R. Stapelfeldt\textsuperscript{5}, and the WFPC2 IDT

\textsuperscript{1} Department of Astronomy, New Mexico State University, Dept. 4500 Box 30001, Las Cruces, NM 88003, USA
\textsuperscript{2} Mt. Stromlo & Siding Spring Obs., Private Bag, Weston Creek P.O., 2611 Canberra, ACT, Australia
\textsuperscript{3} University of Wisconsin, Dept. of Astronomy, 475 N. Charter St., Madison, WI 53706-1582, USA
\textsuperscript{4} New Mexico State Univ., Astron. Dept., Dept. 4500, Box 30001, Las Cruces, NM 88003, USA
\textsuperscript{5} Jet Propulsion Lab., MS 183-900, 4800 Oak Grove Drive, Pasadena, CA 91109, USA

We present HST photometry for three fields in the outer disk of the LMC extending approximately four magnitudes below the faintest main sequence turnoff. We cannot detect any strongly significant differences in the stellar populations of the three fields based on the morphologies of the color-magnitude diagrams, the luminosity functions, and the relative numbers of stars in different evolutionary stages. Our observations therefore suggest similar star formation histories in these regions, although some variations are certainly allowed. The fields are located in two regions of the LMC: one is in the north-east field and two are located in the north-west. Under the assumption of a common star formation history, we combine the three fields with ground-based data at the same location as one of the fields to improve statistics for the brightest stars. We compare this stellar population with those predicted from several simple star formation histories suggested in the literature, using a combination of the R-method of Bertelli et al. (1992) and comparisons with the observed luminosity function. The only model which we consider that is not rejected by the observations is one in which the star formation rate is roughly constant for most of the LMC’s history and then increases by a factor of three about 2 Gyr ago. Such a model has roughly equal numbers of stars older and younger
than 4 Gyr, and thus is not dominated by young stars. This star formation history, combined with a closed box chemical evolution model, is consistent with observations that the metallicity of the LMC has doubled in the past 2 Gyr.

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Bow-shock induced star formation in the LMC?

K.S. de Boer\textsuperscript{1}, J.M. Braun\textsuperscript{1}, A. Vallenari\textsuperscript{2}, and U. Mebold\textsuperscript{3}

\textsuperscript{1} Sternwarte, Univ. Bonn, Auf dem Hügel 71, D-53121 Bonn, Germany
\textsuperscript{2} Osservatorio Astronomico di Padova, Vicolo Osservatorio 5, I-35122 Padova, Italy
\textsuperscript{3} Radioastronomisches Institut, Univ. Bonn, Auf dem Hügel 71, D-53121 Bonn, Germany

The structure of supergiant shells, in particular of LMC 4, is hard to explain with stochastic self-propagating star formation. A series of supergiant structures lies along the outer edge of the LMC and form a sequence increasing clockwise in age. We have considered the rotation of the LMC and its motion through the halo of the Milky Way and propose that these structures find their origin in star formation induced in the bow-shock formed at the leading edge of the LMC. Due to the rotation of the LMC these structures then move aside. The sequence of structures with documented age consists of: the dark cloud south of 30 Dor, N 159, 30 Dor, LMC 4, field near NGC 1818, field near NGC 1783.

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The recent pulse period evolution of SMC X-1

P. Kahabka\textsuperscript{1} and X.-D. Li\textsuperscript{2}

\textsuperscript{1} Astronomical Institute and Center for High Energy Astrophysics, University of Amsterdam, Kruislaan 403, 1098 SJ Amsterdam, The Netherlands
\textsuperscript{2} Department of Astronomy, Nanjing University, Nanjing 210093, P.R. China

SMC X-1 has been discovered in two new high-intensity states during ROSAT HRI observations in December 1995 and May 1997. Pulsations with a period of $0.70795 \pm 0.00017$ s and $0.70706 \pm 0.00011$ s respectively have been detected. A period of $0.709113 \pm 0.000001$ s has been determined in a high-intensity state observed with ROSAT PSPC in October 1991. From the October-91 to the December-95 high-state a change in pulse period with a mean $\dot{\Pi} = -8.86 \pm 1.32 \times 10^{-12}$ s s$^{-1}$ is derived which is significantly lower than the $\dot{\Pi} = -1.2 \times 10^{-11}$ s s$^{-1}$ determined from previous measurements indicating that the spin-up decreased. From the October-91 to the May-97 high-state a change in pulse period with a mean $\dot{\Pi} = -1.15 \pm 0.07 \times 10^{-11}$ s s$^{-1}$ is derived consistent with previous measurements. This indicates that the spin-up decreased temporarily (for $\sim$5 years). From the observed pulse period history taking observations from 89 till May-97 into account the time when an equilibrium period will be
reached, \( \tau_{\Omega} \), and the equilibrium period \( P_{eq} \) have been constrained. This time happens to be \( \lesssim 2000 \) years if the equilibrium period is \( \gtrsim 0.36 \) sec. This time scale is much shorter than the evolutionary time scale of the supergiant donor star of \( \sim 3 \times 10^5 \) years but about equal to the spin-up time scale of \( \sim 2000 \) years of the neutron star. The period determination (detection of pulsations) \( \sim 2 \) weeks after an X-ray turn-off during an X-ray low intensity state in October 1991 allows to put constraints on a (possible) spin-down torque applied to the neutron star. The period derivative derived within 10 days is \( \dot{P} \approx -9 \pm 2 \times 10^{-12} \text{ s}^{-1} \). This would mean that the accretion torque stayed rather constant in sign and magnitude. The underlying mechanism causing the transition from X-ray low to high-intensity states (and vice versa) may be due to accretion disk precession with a quasi-periodicity of \( \sim 60 \) days or due to a variable mass-loss rate of the supergiant companion star resulting in a varying mass-accretion rate onto the neutron star.

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Optical Gravitational Lensing Experiment
Photometry of the MACHO-SMC-1 Microlensing Candidate

A. Udalski\(^1\), M. Szymański\(^1\), M. Kubiak\(^1\), G. Pietrzyński\(^1\), P. Woźniak\(^2\), and K. Żebruń\(^1\)

\(^1\) Warsaw University Observatory, Al. Ujazdowskie 4, 00-478 Warszawa, Poland
\(^2\) Princeton University Observatory, Princeton, NJ 08544-1001, USA

We present photometric observations of the MACHO-SMC-1 microlensing candidate collected by the OGLE-2 project. We show light curves of both components of the 1.6 arcsec blend: microlensed star and its optical companion. We find the contribution of the optical companion to the total flux to be 24% and confirm presence of the small amplitude periodic oscillations in the light curve of the lensed star with the period of 5.096 days and amplitude 0.05 mag. The lensed star is probably an ellipsoidal binary system.

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Binary Source Parallactic Effect in Gravitational Micro-lensing

Bohdan Paczyński\(^1\)

\(^1\) Princeton University Observatory, Princeton, NJ 08544-1001, USA

The first micro-lensing event discovered towards the Small Magellanic Cloud by the MACHO collaboration (Alcock et al. 1997b) had a very long time scale, \( t_0 = 123 \) days. The EROS collaboration (Palanque-Delabrouille et al. 1997) discovered a \( \sim 2.5\% \) brightness variation with a period \( P = 5.1 \) days. The OGLE collaboration (Udalski et al. 1997) established that the variation persists while the micro-lensing event is over, and the variable star is the one which has been micro-lensed, not its blend.
The simplest explanation of the periodic variability is in terms of a binary star with the orbital period $P_{\text{orb}} = 10.2$ days, with its component(s) tidally distorted. Such objects are known as ellipsoidal variables. The binary nature should be verified spectroscopically.

Binary motion of the source introduces a parallactic effect into micro-lensing light curve, and a few examples are shown. The effect is relatively strong if the light center and the mass center of a binary are well separated, i.e., if the binary has a large photometric dipole moment. The diversity of binary parameters is large, and the corresponding diversity of photometric effects is also large. The presence or absence of the effect may constrain the lens mass and its distance from the source.

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On the Consistency between the Outer Rotation Curve of the Galaxy and the Microlensing Rate towards the Large Magellanic Cloud

Z. H. Zhu$^1$ and X. P. Wu$^2$

$^1$ Institute of Theoretical Physics, Chinese Academy of Sciences, Beijing 100080, China
$^2$ Beijing Astronomical Observatory, Chinese Academy of Sciences, Beijing 100080, China

Recent determination of the outer rotation curve of the Galaxy suggests that the total Galactic mass is likely to concentrate within a region of radius $\sim 2R_0$. If this finding is correct, the previously estimated optical depth of microlensing events towards the Large Magellanic Cloud (LMC) should be correspondingly reduced. It appears that a truncated Galactic halo model instead of the standard isothermal one extending to LMC accounts naturally for the reported microlensing rate by the MACHO collaboration. Such an explanation is indeed obvious yet has been overlooked in the past.

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Abstracts of Non-Refereed Papers

Rings and Echoes, An Overview

Arlin P.S. Crotts

1 Dept. of Astronomy, Columbia U., 550 W. 120th St., New York, NY 10027, USA

The volume around the SN 1987A contains a variety of structures, including but certainly not limited to the three-ring nebula glowing in recombination lines. Many of these structures are revealed by light echoes, hence have been mapped in three dimensions by our optical imaging monitoring of the field around the SN. The three rings are part of a bipolar nebula which contains them at its waist and crowns, and which is itself contained in a larger, diffuse nebula with a detectable equatorial overdensity. This diffuse nebula terminates in a boundary overdensity which most likely marks the inner edge of a bubble blown by the main sequence wind of the progenitor star and its neighbors. Beyond this bubble is a rich collection of interstellar structures revealed by light echoes. In addition to detecting and mapping these structures, we add dynamical and age information by establishing the kinematics of the gas, both on interstellar and circumstellar scales. These reveal, for instance, a timescale for the outer circumstellar rings which is in close agreement with the inner ring. The presence of these structures, their ages and morphologies should be included in any model explaining the evolution of the progenitor star and its mass loss envelope.

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DENIS Survey of AGB and Tip-RGB Stars in the LMC Bar West and Optical Center Fields

C. Loup and A. Omont1, P.A. Duc, P. Fouqué, and E. Bertin2, and N. Epchtein3

1 Institut d’Astrophysique de Paris, CNRS, Paris, France
2 European Southern Observatory (ESO), Garching, Germany
3 DESPA, Observatoire de Paris, Paris, France

We have observed with the DENIS instrument two regions of 22' × 23', located in the Bar of the LMC, and overlapping the Bar West and Optical Center fields studied by Blanco et al. (1980, BMB) in a prism-objective survey. Observations were performed simultaneously in the I, J, and Ks bands. There were 376 AGB stars identified in previous studies in these 2 fields. We typically find back 97% of them in the DENIS data. We show that the BMB’s M and C stars follow two different sequences in the (I–J,J–Ks) colour-colour diagram. For M stars, the [I–J] colour is an indicator of the M subtype, increasing from 0.9 to 1.8 as one goes from M0 to M7 spectral types, while the [J–Ks] colour remains almost constant (from 1.0 to 1.35). Conversely, C stars are located on a “reddening” branch, with [J–Ks] ranging from 1.0 to about 2.2. M and C stars discovered by BMB have no or faint mass-loss. The (I–J,J–Ks) diagram allows to define a simple criterion to select stars of spectral types M and C. With this criterion, we find a total of 1177 new AGB and tip-RGB stars candidates, and have
calculated the bolometric luminosities of all of them as well as previously known stars, assuming a distance modulus of 18.55. 90% of the new candidates are blue sources, not searched for in a complete way by BMB. Their luminosity distribution shows a very clear peak at $M_{bol} \simeq -3.5$, that we interpret as the tip of the Red Giant Branch. A second group is formed by stars for which the BMB survey should have been complete (i.e., relatively red C stars and M stars with spectral type later than M5.5). We find, however, 23% and 38% more such stars than they do in the Bar West and Optical Center, respectively.

Finally, we also discover in this study 42 red sources, with $2.2 < [J-K_S] < 4.2$. These stars experience mass-loss at significant rates. Note that there might be redder obscured AGB stars in the fields, but that the DENIS limiting magnitudes do not allow to detect sources with $[J-K_S]$ larger than about 4. Only 4 of them have an IRAS counterpart. It is interesting to note that we discover 42 mass-losing AGB stars in 0.14 square degrees, while only about 50 have been discovered in the whole LMC using the IRAS data. The luminosity distribution of these red sources is very similar to the one of the BMB's C stars, ranging from $M_{bol} \simeq -3.5$ to $-6$.

Proceedings of the third Euroconference on near IR surveys, in press

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Thesis Abstract

Ultraviolet and Optical Observations of the Supernova 1987A with HST and IUE

Chun S. Jason Pun\textsuperscript{1,2}

\textsuperscript{1} Harvard-Smithsonian Center for Astrophysics, 60 Garden Street, Cambridge, MA 02138, USA
\textsuperscript{2} Present address: Laboratory for Astronomy and Solar Physics, Code 681, NASA/GSFC, Greenbelt, MD 20771, USA

Supernova 1987A (SN 1987A) in the Large Magellanic Cloud provides a unique opportunity for the study of supernovae. Its proximity and brightness make it an ideal object for testing theories of supernovae, and of stellar evolution in general. Studies of SN 1987A are greatly enhanced by the space based observatories which extend the ground based results both in wavelength (International Ultraviolet Explorer IUE and Hubble Space Telescope HST) and in time coverage (HST). I present the spectroscopic and imaging observations obtained by IUE and HST on the SN 1987A debris.

The evolution of the ultraviolet spectrum of SN 1987A is studied by generating a complete catalogue of the IUE data (day 1 \textendash 1248). Special attention is paid on the correct background flux subtraction from neighboring stars. The bolometric luminosity of SN 1987A is recalculated to properly include contribution from the UV flux, which becomes increasingly important in late times. Study of the UV color shows that the supernova debris gets bluer in UV around the time of dust formation, which may imply that the dust formed is metal rich.

UV and optical observations of SN 1987A with HST started (day 1278) when it became difficult to observe it with IUE and from the ground. The properties of the debris are studied by fitting the observed image profiles with a brightness function derived from the spectroscopic data. The size of the debris is measured over time and it is found to be expanding homologously at \( \sim 2800 \text{ km s}^{-1} \) in all optical wavebands. The measured velocity reflects that of the radioactive Fe core and its magnitude suggests mixing of the newly synthesized Ni to the layers of the supernova envelope.

With the post service mission images, the shape and asymmetry of the debris can also be studied. The supernova atmosphere is asymmetric at a level of \( \sim 10 \text{\sim} 15\% \) and its major axis is aligned with the axis of the circumstellar ring system. In the last HST images taken in 1997 July (day 3792), small scale structures of the debris are observed. The geometry and dynamics of these structures are shown to be consistent with a model where clumps of materials are ejected above and below the plane of the circumstellar ring. This provides for the first time direct connection between the supernova explosion debris and its circumstellar gas and imposes important constraints on the progenitor models and explosion dynamics of the supernova.

Ph.D. Thesis completed at Harvard University in November 1997
under direction of Prof. Robert P. Kirshner.

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Job Opportunity

Postdoctoral Scientist at Columbia University

Columbia University
Columbia Astrophysics Laboratory
Mail Code 5240
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New York, NY 10027, USA

Attn: Assoc. Prof. Arlin Crotts
E-mail: arlin@astro.columbia.edu

We seek a postdoctoral scientist to conduct research into the circumstellar and interstellar environment of Supernova 1987A. The work would include completed, ongoing and planned observations of SN1987A and its surroundings, including data from IUE, UIT, ISO, HST and ground-based observatories, plus preparation for observations with future ground, airborne and space-based instruments. Research topics include mapping the SN’s circumstellar nebula and the interstellar medium of the 30 Doradus region using light echoes, detailing the composition, density and velocity structure of the circumstellar envelope, analyzing polarimetric and photometric properties of surrounding dust, measuring the reflected ultraviolet flux from SN shock breakout, and observing interaction between the SN ejecta and circumstellar envelope during the formation of Supernova Remnant 1987A.

We seek excellent candidates practiced in some of the above observational techniques and knowledgeable concerning circumstellar and interstellar processes. The person selected will study these problems as well as to develop her/his own related investigations, with support for observation, publication and professional travel. This funded position is available for one year with the possible extension to up to three years, starting in mid-to-late 1998.

Applicants should provide a curriculum vitae, summary of research, and names of three colleagues willing to write letters of reference, by 2 February 1998 to the address above. Further information can be found at the website http://www.astro.columbia.edu/~arlin/sn1987a.html. Columbia University is an Affirmative Action/Equal Opportunity Employer.
Meeting Announcements

IAU Symposium No. 193:
Wolf-Rayet Phenomena in Massive Stars and Starburst Galaxies

On August 28 the IAU Executive Committee decided on the IAU meeting programme for 1998 (Sidereal Times 1997, No. 11 (29 August 1997), p. 8). To our pleasure we can announce the formal approval of IAU Symposium No. 193 on Wolf-Rayet phenomena in massive stars and starburst galaxies, in Puerto Vallarta on the West Coast of Mexico, 3 – 7 November 1998.

Scope of the symposium
The physics of Wolf-Rayet stars has major highlights: they are the most advanced observed stage of massive star evolution, progenitors of supernovae and sources of cosmic rays. They are the result of massive star evaporation, and provide nucleosynthesis tests. Just as WR stars are a particular phase in the evolution of massive stars, WR galaxies are a stage in the evolution of the dominant starburst stellar population in dwarf irregular galaxies or H II galaxies. During the last decade the major role of starbursts in the evolution of the universe has become evident. Recent years have seen avalanches of new observational results in the field of WR stars and WR galaxies from space observatories like IUE, HST, HUT, ROSAT, ASCA, GRO and ISO, from the airborne observatory KAO, and from ground-based (adaptive optics) optical, IR, and radio observatories. E.g., new observations in the centre of our own Galaxy reveal an large number of hot luminous helium-rich stars of WR-type and Of/WN-type, whose winds may have a profound influence on the evolution of the Galactic Centre. The spectroscopic WR phenomenon allows massive starbursts to be observed out to huge distances, and thus to be studied at great variety. While these observational developments are taking place on both the extragalactic and stellar fronts, also on the theoretical and modeling side there are important developments in atmosphere modeling techniques, galaxy/starburst spectral synthesizing and stellar evolution modeling.

Outline of scientific programme:
1. Basic observational properties of WR stars and other hot massive stars.
2. State of the art of model atmospheres for single star evolution of massive stars: wind + atmosphere + interior.
3. Hydrodynamical interaction of WR stars and other hot massive stars with their environment: colliding winds and ring nebulae.
4. The role of WR stars and other hot massive stars in the Galactic Center and in giant H II regions.
5. WR stars and other hot massive stars in starburst galaxies. The case of WR galaxies.
6. Starbursts and their role in the spectral and chemical evolution of galaxies.

Scientific Organizing Committee:
P.S. Conti (USA), M.A. Dopita (Australia), F. Ferrini (Italy), T.M. Heckman (USA), K.A. van der Hucht (chair, the Netherlands), R.D. Joseph (USA), G. Koenigsberger (Mexico), D. Kunth (France), C. Leitherer (USA), A. Maeder (Switzerland), F. Matteucci (Italy), J. Melnick (Chile), A.F.J. Moffat (Canada), W. Schmutz (Switzerland), W.D. Vacca (USA), P.M. Williams (UK), and A.J. Willis (UK).

Local Organizing Committee:
S.J. Arthur (Morelia), E. Brinks (Guanajuato), O. Cardona (Puebla), P.R.J. Eenens (chair, Guanajuato), G. Garcia-Segura (Mexico City), J. Guichard (Puebla), G.Koenigsberger (Mexico City), J.F. Lopez (Mexico City), A. Serrano (Puebla), and M. Tapia (Ensenada).

Contacts:
Karel A. van der Hucht, chair SOC e-mail: k.vanderhucht@sron.ruu.nl
Philippe Eenens, chair LOC e-mail: iau193@carina.astro.ugto.mx
IAU Colloquium 169
Variable and non-spherical stellar winds in luminous hot stars

Date and venue
The colloquium will be held on June 15–19, 1998, in Heidelberg, Germany. Heidelberg is located in the south-west of Germany about 100 km south of Frankfurt Airport.

Scope of the colloquium
Since the discovery of strong P Cyg profiles in their satellite-UV spectra more than 25 years ago, the mass loss of luminous hot stars by stellar wind has become a subject of top physical interest. The most massive stars may lose more than 50% of their initial mass through winds before reaching the supernova stage. Such stars are important sources of processed matter and energy for the interstellar medium. With large telescopes individual luminous blue stars can be studied with high spectroscopic resolution even in extragalactic systems. They are, therefore, important tools to investigate the physical conditions in extragalactic systems of different Hubble types.

Recent important discoveries and new developments resulted in a new view of the mass-loss properties and mechanisms. Spectroscopic time series in the satellite UV (with IUE) and in the ground-based wavelength ranges have shown that time variability is a general characteristic of mass loss of luminous hot stars and that steady state flows do not provide a good description of the observed properties. Rotation and pulsation most likely play an important role in modifying and maybe even triggering the mass loss. Some observational facts can be explained only by the presence of magnetic fields. Likewise much evidence has been accumulated that the winds are (at least in many cases) non-spherical. In some spectacular cases the asymmetric outflows could be directly imaged with the HST. Other important observations have been made in the X-ray wavelength range with ROSAT and AXAF and in the infrared with ISO. There are also many new theoretical contributions concerning pulsational effects and the formation of the observed disks around luminous hot stars.

These recent new results make it desirable to have a colloquium which brings together the specialists in this field from all continents, in order to further develop the emergent concepts of wind variability and asphericity, and in order to try finding answers to these most urgent questions, with the aim of a better physical understanding of the mass loss from hot luminous stars and of the evolutionary consequences.

Outline of the scientific program:
- Observations of non-spherical winds
- Theories of non-spherical winds
- Variable winds
- Pulsation
- Theories of wind variations
- Evolutionary aspects

Scientific Organising Committee

Please direct correspondence about the scientific programme to the SOC at the following email address: B.Wolf@1sw.uni-heidelberg.de

Local Organising Committee
I. Appenzeller, B. Baschek, A. Kaufer, G. Klare, D. Lemke, H. Mandel, T. Rivinius, O. Stahl (chairperson), T. Szefert and B. Wolf: iauc169@1sw.uni-heidelberg.de

Web page
Information about the colloquium, registration, contributions, and accommodation is available on the Web at: http://www.1sw.uni-heidelberg.de/iaucoll/
4th International Workshop on Microlensing Surveys

Date and venue
The workshop will be held at the Collège de France and the Institut d’Astrophysique de Paris in Paris, France, on January 15 – 17, 1998. It is sponsored by INSU-CNRS, IN2P3-CNRS and DAPNIA-CEA. Deadline for registration is November 30, 1998.

Scope of the workshop
This workshop is intended to bring together the microlensing community to prepare the future of gravitational microlensing surveys.

Outline of the scientific program:
• Experimental results towards the LMC & SMC
• Experimental results from follow-up networks
• Experimental results towards M31
• Technical developments and upgrades
• Microlensing as a tool for astrophysics
• Future: observations and prospects

Scientific Organising Committee
Ch. Alcock (Los Alamos), D. Bennett (Notre-Dame), A. Crotts (Columbia), Y. Giraud-Héraud (Collège de France), A. Gould (Ohio), J. Kaplan (Collège de France), M. Moniez (LAL-Orsay), B. Paczynski (Princeton), J. Rich (DAPNIA-CEA), P. Sackett (Groningen), M. Spiro (DAPNIA-CEA), C. Stubbs (Washington), A. Vidal-Madjar (IAP), P. Yock (Auckland)

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Contact/secretary
Hélène Le Bihan
PCC-Collège de France
11, place Marcelin Berthelot
75231 Paris cedex 5, France
Phone: 33-1-44 27 14 39
Fax: 33-1-43 54 69 89
E-mail: microl4@cdf.in2p3.fr

Webpage