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In memoriam

Our colleague and friend Manuel Forestini suddenly died from a heart attack, on March 11, 2003. He was 40 years old.

Manuel was a specialist of stellar structure and evolution. He had developed a code which follows the evolution of stars of all masses from the pre-main sequence, including accretion, up to the later phases, and which includes "non-standard" processes like diffusion or rotation. Though he has been working on many subjects his favourite objects were the AGB stars. Particularly remarkable are his contributions to the understanding of the nucleosynthesis in low- and intermediate-mass stars and of the role these stars play in chemical evolution.

Manuel did everything with passion, including his research and teaching. His enthousiasm and skills as a physics teacher were famous not only amongst his peers but within the student community as well. His talent and engaging personality helped Manuel continuously attract the very best students to graduate studies in astronomy. His first book on stellar structure had become a reference in the field. Among his numerous projects for the future, he was planning on writing another one on stellar evolution, his cherished topic.

A loving and attentive husband, blessed last year by the adoption of a daughter, Camille, he will be sorely missed by his family and by us all who knew him. It his with uncontained emotion that the whole community wishes to address Cecile, his wife, and Camille, its most sincere sympathy.

If you want to send a message of sympathy to his family, please send it (before april 25th) to
Sandrine.Vignon@obs.ujf-grenoble.fr
with "Manuel Forestini" in the subject field. These messages will be collected in a book for his family.

Abstract of recently accepted papers

WR central stars of PN and the binary evolutionary channel

Orsola De Marco[1], E.L. Sandquist[2], M.-M. Mac Low[1], F. Herwig[3] and R.E. Taam[4]

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Single star evolutionary calculations have recently succeeded in reproducing the composition of the hydrogen-deficient Wolf-Rayet (WR) central stars of planetary nebula (PN). However, the latest infra-red observations, made it clear that the single star scenario is at odds with the properties of the dust surrounding many WR central stars. Binarity, on the other hand, can potentially explain the infra-red observations, as well as offer a viable way of depleting a star of its outer, H-rich envelope. In this work we expose two binary scenarios first

discussed in connection to WR central stars by De Marco & Soker. In the first, a close binary system results in back-flowing material and ultimately in a H-deficient central star of PN. This scenario, is invoked to explain the [WC10] central star composition deficiency and its dusty disk. The second scenario envisages that the majority of WR central stars are the result of a merger with a low mass companion during the Asymptotic Giant Branch (AGB) phase. This scenario is partly tested here, by 3-dimensional hydrodynamical models, which simulate the common envelope phase between 0.1 and 0.2-$M_\odot$ companions and an AGB star at the first and tenth thermal pulse.

Invited talk: VIII Texas-Mexico conference on Astrophysics - "Energetics of Cosmic Plasmas"

Preprints can be obtained by contacting orsola@amnh.org
or via anonymous ftp on ftp://astroftp.amnh.org/pub/orsola/PreOffPrints/revmex03.ps.gz

Spectroscopic analysis of two CH subgiant stars : HD 50264 and HD 87080.

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We present the abundance pattern of two CH subgiant stars HD 50264 and HD 87080 based on high-resolution optical spectra. We also determined the spectroscopic stellar atmospheric parameters, temperature and micro-turbulent velocity as well as stellar surface gravity from a solution of excitation and ionization equilibria of Fe I and Fe II lines under the assumption of local thermodynamic equilibrium. The abundance analysis reveals HD 50264 with a metallicity of [Fe/H]=-0.34 and HD 87080 with a metallicity of [Fe/H]=-0.51.

We compare the abundance pattern with abundances of disk stars and also with other stars of the same class. We found that iron group, α-elements, manganese, as well as sodium and aluminum of HD 50264 and HD 87080 follow the abundance pattern of the disk stars. The heavy-element abundance pattern of both stars shows enhancements by a factor of 4-6 with respect to the sun. By heavy-element we mean the elements that have been synthesized by neutron capture, such as barium, yttrium and zirconium. We also discuss the abundances of the s-process elements and compare our results with other binary systems that display enrichment due to neutron-capture reactions, through several diagrams involving the index [hs/ls] and [s/Fe], the metallicity and [C/Fe] ratio. We compare the observed abundance of the heavy elements with theoretical nucleosynthesis calculations. This shows that the s-process are best fit by models in which the seed nuclei are exposed to single neutron irradiation and with a neutron exposure of τ=0.9 and τ=1.0 respectively for HD 50264 and HD 87080. We also use the [Rb/Zr] ratio in order to investigate how this ratio behaves *versus* metallicity for other binary systems, including HD 50264 and HD 87080 that are s-process enriched.

Accepted by Astronomy and Astrophysics

Preprints can be obtained by contacting claudio@on.br

Hydrodynamic Interaction of Strong Shocks with Inhomogeneous Media - I: Adiabatic Case

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Many astrophysical flows occur in inhomogeneous (clumpy) media. We present results of a numerical study of steady, planar shocks interacting with a system of embedded cylindrical clouds. Our study uses a two-dimensional geometry. Our numerical code uses an adaptive mesh refinement allowing us to achieve sufficiently

high resolution both at the largest and the smallest scales. We neglect any radiative losses, heat conduction, and gravitational forces. Detailed analysis of the simulations shows that interaction of embedded inhomogeneities with the shock/postshock wind depends primarily on the thickness of the cloud layer and arrangement of the clouds in the layer. The total cloud mass and the total number of individual clouds is not a significant factor. We define two classes of cloud distributions: thin and thick layers. We define the critical cloud separation along the direction of the flow and perpendicular to it distinguishing between the interacting and noninteracting regimes of cloud evolution. Finally we discuss mass-loading and mixing in such systems.

Accepted by Astrophysical Journal

Preprints can be obtained by contacting wma@pas.rochester.edu *or via WWW on* http://www.pas.rochester.edu/ wma/publicatio

Reprocessing the Hipparcos data of evolved stars III. Revised Hipparcos period-luminosity relationship for galactic long-period variable stars.

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We analyze the K band luminosities of a sample of galactic long-period variables using parallaxes measured by the Hipparcos mission. The parallaxes are in most cases re-computed from the Hipparcos Intermediate Astrometric Data using improved astrometric fits and chromaticity corrections. The K band magnitudes are taken from the literature and from measurements by COBE, and are corrected for interstellar and circumstellar extinction.

The sample contains stars of several spectral types: M, S and C, and of several variability classes: Mira, semiregular SRa, and SRb. We find that the distribution of stars in the period-luminosity plane is independent of circumstellar chemistry, but that the different variability types have different P-L distributions. Both the Mira variables and the SRb variables have reasonably well-defined period-luminosity relationships, but with very different slopes. The SRa variables are distributed between the two classes, suggesting that they are a mixture of Miras and SRb, rather than a separate class of stars. New period-luminosity relationships are derived based on our revised Hipparcos parallaxes. The Miras show a similar period-luminosity relationship to that found for Large Magellanic Cloud Miras by Feast et al. (1989).

The maximum absolute K magnitude of the sample is about -8.2 for both Miras and semi-regular stars, only slightly fainter than the expected AGB limit. We show that the stars with the longest periods ($P > 400$ d) have high mass loss rates and are almost all Mira variables.

Accepted by A&A

Preprints can be obtained by contacting gk@astro.princeton.edu
or via WWW on http://www.astro.princeton.edu/ gk/PAPERS/pl.ps and pl.table1

Quantitative classification of WR nuclei of planetary nebulae

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We analyse 42 emission-line nuclei of Planetary Nebulae (PNe), in the framework of a large spectrophotometric survey of [WC] nuclei of PNe conducted since 1994, using low/medium resolution spectra obtained at ESO and at OHP. We construct a grid of selected line-intensities (normalized to CIV-5806 Å = 100) ordered by decreasing ionisation potential going from 871 to 24 eV. In this grid, the stars appear to belong clearly to prominent O (hot [WO1-4] types) or C (cooler [WC4-11] types) line-sequences, in agreement with the classification of massive WR stars applied to Central Stars of Planetary Nebulae (CSPNe) by Crowther et al. 1998 (CMB98). We propose 20 selected line ratios and the FWHM of CIV and CIII lines as classification diagnostics, which agree well with the 7 line ratios and the FWHM proposed by CMB98. This classification based on ionisation is related to the evolution of the temperature and of the stellar wind, reflecting the mass-loss history. In particular, inside the hot [WO4]-class, we discover four stars showing very broad lines over the whole spectral range. These stars possibly mark the transition from the initial momentum-driven phase to the later energy-driven phase of the CSPNe along their evolution from the post-Asymptotic Giant Branch (post-AGB) phase through [WC] late, [WC4] and [WO]-types. The HR diagram and the diagram linking the terminal velocity and the temperature indicate highly dispersed values of the stellar mass for our sample, around a mean mass higher than for normal CSPNe. The distribution of the 42 stars along the ionisation sequence shows 24% of [WO1-3], 21% of [WO4], 17% of [WC4] hot stars, and 26% of [WC9-11] cool stars. The [WC5-8] classes remain poorly represented (12%). This distribution is confirmed on the basis of a large compilation of the 127 known emission-lines CSPNe, which represent about 5% of the known PNe.

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Preprints can be obtained by contacting acker@astro.u-strasbg.fr

Photometry and low resolution spectroscopy of hot post-AGB candidates

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We have obtained Johnson U, B, V and Cousins R, I photometry and low resolution spectra of a small sample of hot post-AGB candidates. Using the present data in combination with JHK data from 2MASS, infrared data from the MSX catalog and the IRAS fluxes, we have studied the spectral energy distribution (SED) of these stars. Using the DUSTY code we have estimated the dust temperatures, the distances to the stars, the mass-loss rates, angular radii of the inner boundary of the dust envelopes and dynamical ages from the tip of the AGB. These candidates have also been imaged through a narrow band Hα filter, to search for nebulosity around the central stars. Our Hα images revealed the bipolar morphology of the low excitation PN IRAS 17395-0841 with an angular extent of 2.8″. The bipolar lobes of IRAS 17423-1755 in Hα were found to have an angular extent of 3.5″ (south-east lobe) and 2.2″ (north-west lobe). The dust envelope characteristics, low resolution spectrum and IRAS colors suggest that IRAS 18313-1738 is similar to the proto-planetary nebula (PPN) HD 51585. The SED of IRAS 17423-1755, IRAS 18313-1738 and IRAS 19127+1717 show a warm dust component (in addition to the cold dust) which may be due to recent and ongoing mass-loss.

Accepted by Astronomy & Astrophysics

Preprints can be obtained by contacting gauba@iiap.ernet.in

Announcement

Announcing the Availability of the 2MASS All-Sky Catalogs

The Two Micron All Sky Survey[1] *and X.Y. Author-2*[2]

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The Two Micron All Sky Survey (2MASS) is pleased to announce that the All-Sky Data Release Point Source Catalog (PSC) and Extended Source Catalog (XSC) are now available. The All-Sky PSC contains accurate positions and J, H and K_s photometry for over 470 million sources, most of which are stars in the Milky Way, but some of which are extragalactic sources. The All-Sky XSC contains positions, three-band photometry and basic shape information for over 1.6 million resolved sources, most of which are galaxies. The 2MASS "Quicklook" Atlas Images, have been available online since October of last year.

An introduction to the Release data products and supporting documentation is available at http://www.ipac.caltech.edu/2mass/releases/allsky/, or you may access the Catalogs and Images directly from the NASA/Infrared Science Archive at http://irsa.ipac.caltech.edu/. The Catalogs will be available via bulk ftp download soon and on a limited-distribution DVD-ROM in the near future.

Users are strongly encouraged to review the Explanatory Supplement to the 2MASS All-Sky Data Release at http://www.ipac.caltech.edu/2mass/releases/allsky/doc/explsup.html for general information about the Survey, the formats, characteristics and cautionary notes about the Catalogs.

User support is available via the 2MASS Help Desk at 2mass@ipac.caltech.edu.

See http://www.ipac.caltech.edu/2mass/.