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Abstract of recently accepted papers

Long Period Variable Stars: galactic populations and infrared luminosity calibrations.

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In this paper HIPPARCOS astrometric and kinematic data are used to calibrate both infrared luminosities and kinematical parameters of Long Period Variable stars (LPVs). Individual absolute K and IRAS 12 and 25 luminosities of 800 LPVs are determined and made available in electronic form.

The estimated mean kinematics is analyzed in terms of galactic populations. LPVs are found to belong to galactic populations ranging from the thin disk to the extended disk. An age range and a lower limit of the initial mass is given for stars of each population. A difference of 1.3mag in K for the upper limit of the Asymptotic Giant Branch is found between the disk and old disk galactic populations, confirming its dependence on the mass in the main sequence.

LPVs with a thin envelope are distinguished using the estimated mean IRAS luminosities. The level of attraction (in the classification sense) of each group for the usual classifying parameters of LPVs (variability and spectral types) is examined.

Accepted by A&A
Preprints can be obtained by contacting menes@graal.univ-montp2.fr
or on http://arXiv.org/abs/astro-ph/0105552

Dusty winds : I. self-similar solutions

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We address the dusty wind problem, from the point where dust formation has been completed and outward. Given grain properties, both radiative transfer and hydrodynamics components of the problem are fully defined by four additional input parameters. The wind radiative emission and the shape of its velocity profile are

both independent of the actual magnitude of the velocity and are determined by just three dimensionless free parameters. Of the three, only one is always significant—for most of phase space the solution is described by a set of similarity functions of a single independent variable, which can be chosen as the overall optical depth at visual $\tau_{\rm V}$. The self-similarity implies general scaling relations among mass loss rate ($\dot{M}$), luminosity (L) and terminal velocity (v_∞). Systems with different $\dot{M}$, L and v_∞ but the same combination $\dot{M}/L^{3/4}$ necessarily have also the same $\dot{M}v_\infty/L$. For optically thin winds we find the exact analytic solution, including the effects of radiation pressure, gravitation and (sub- and supersonic) dust drift. For optically thick winds we present numerical results that cover the entire relevant range of optical depths, and summarize all correlations among the three global parameters in terms of $\tau_{\rm V}$. In all winds, $\dot{M} \propto v_\infty^3(1+\tau_{\rm V})^{1.5}$ with a proportionality constant that depends only on grain properties. The optically thin end of this universal correlation, $\dot{M} \propto v_\infty^3$, has been verified in observations; even though the wind is driven by radiation pressure, the luminosity does not enter because of the dominant role of dust drift in this regime. The $\dot{M}$–L correlation is $\dot{M} \propto (L\tau_{\rm V})^{3/4}(1+\tau_{\rm V})^{1.05}$. At a fixed luminosity, $\dot{M}$ is *not* linearly proportional to $\tau_{\rm V}$, again because of dust drift. The velocity-luminosity correlation is $v_\infty \propto (L\tau_{\rm V})^{1/4}(1+\tau_{\rm V})^{-0.465}$, explaining the narrow range of outflow velocities displayed by dusty winds. Eliminating $\tau_{\rm V}$ produces $v_\infty^3 = A\,\dot{M}\left(1+B\,\dot{M}^{4/3}/L\right)^{-1.5}$, where A and B are coefficients that contain the only dependence of this universal correlation on chemical composition. At a given L, the maximal velocity of a dusty wind is $v_{\rm max} \propto L^{1/4}$ attained at $\dot{M} \propto L^{3/4}$, with proportionality coefficients derived from A and B.

Accepted by MNRAS

For preprints, contact moshe@pa.uky.edu or http://xxx.lanl.gov/abs/astro-ph/0106096

The highly collimated bipolar outflow of OH 231.8+4.2

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We present high spatial resolution observations of the CO molecular emission ($J = 1-0$ and $J = 2-1$ lines) in the post-AGB bipolar nebula OH 231.8+4.2. High-quality NIR images (J, H, K′ bands) of light scattered by grains were also obtained. Our observations probe the bulk of the nebular material, providing maps with a resolution $\sim 1''$ of the mass distribution, both CO and NIR images being very closely coincident. The combination of the two ^{12}CO lines has been used to measure the distribution of the kinetic temperature in the nebula, which is found to be very low, ranging between 8 K, in the outer southern clumps, and 35 K, in the central region. A relative temperature increase is found in the northernmost condensation, probably associated to a strong bow-like shock. Since velocities are also measured in CO, the dynamic parameters (kinetic momentum and energy) are also measured with high resolution. Most of the nebular mass ($\sim 0.64\ M_\odot$) is located in the central condensation and flows at expansion velocities ≤ 40 km s^{-1}. The rest of the gas, $\sim 0.3\ M_\odot$ almost equally distributed in the two lobes, flows along the nebular axis at high velocities, that increase proportionally to the distance to the central star reaching values as large as 430 km s^{-1}, as a result of a sudden acceleration happened about 770 yr ago. The general mass distribution in OH 231.8+4.2 is found to be clumpy and very elongated, with a length/width ratio reaching a factor 20 in the southern tail. In the center, however, we find a double hollow-lobe structure, similar to those found in other well studied protoplanetary nebulae. We stress the enormous kinetic linear momentum carried by the molecular nebula, about 27 $M_\odot$ km s^{-1} ($5.5\,10^{39}$ g cm s^{-1}). The kinetic energy is also very high, $\sim 1700\ M_\odot$ km^2 s^{-4} $\sim 3.4\ 10^{46}$ erg. Given the short time during which the acceleration of the molecular outflow took place, we conclude that the linear momentum carried by the stellar photons is about a factor 100 smaller than that carried by the outflow, even if the effects of multiple scattering are taken into account. We independently argue that radiation pressure directly acting onto grains (the mechanism thought to be responsible for the mass ejection in AGB envelopes) cannot explain the observed bipolar flow, since this would produce a significant shift between the dust and gas features that is not observed. Finally, we review the uncertain nature and evolutionary status of this unique object.

Accepted by Astronomy and Astrophysics

Preprints can be obtained by contacting j.alcolea@oan.es *or via WWW on* http://www.oan.es/preprints

On the Transience of high-latitude OH/IR Stars: II the thermal pulse link

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High-latitude, $|b| \geq 10°$, AGB stars in their superwind phase have distinctive IR colors, which make them easy to identify and count. But the expansion velocity (Ve) versus color plots of these stars are a puzzle, with features implying (i) a step increase in dM/dt, and (ii) short-term changes in the circumstellar shell that are enhanced by increased metallicity. The net duration of their superwind phase is ∼3700 yr when estimated from the relative frequency of associated proto planetary nebulae, and the ∼103 yr expansion age of one, IRAS 18095+2704. Since these stars lose on average $\sim 0.04\,M_\odot$ during the superwind phase, and have progenitor masses circa $1\,M_\odot$, they must lose $> 0.3\,M_\odot$ prior to the AGB.

A single 3700 yr superwind episode, however, cannot explain the 2-18 km s^{-1} range of expansion velocities exhibited by these stars. This range is best understood as resulting from a cyclical superwind, wherein stars lose most of their envelope mass in 3-4 discrete episodes of ever larger Ve, with each episode being triggered by a sudden onset in the coupling of photon momentum by dust to gas near a thermal pulse. The resulting newly-accelerated shell thereafter quickly expands beyond the protective dust shroud of the prior shell, which allows interstellar UV to degrade its molecules. This turns the shell into an OH/IR star color mimic (a shell with the dM/dt of an OH/IR star without 1612 MHz masers), until enough dust is again in place beyond the shell to allow molecules the longevity needed to support masers. Two byproducts of this model are the natural explanation it offers for why Ve(CO) > Ve(OH), as well as for the occurrence and integration of mimics into the normal development of a shell. The circumstellar shells of high-latitude OH/IR stars are thus cyclically transient phenomena.

Accepted by Astrophysical Journal *For preprints, contact* blewis@naic.edu
or ftp://ftp2.naic.edu/pub/publications/bml/ho2.ps.gz or ho2.pdf

Chemical abundances of planetary nebulae from ORLs – II. The neon abundance of NGC 7009

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We present high quality observations of Ne II optical recombination lines (ORLs) for the bright Saturn Nebula NGC 7009. The measured line fluxes are used to determine Ne^{2+}/H^+ abundance ratios. The results derived from individual multiplets of the 3s–3p and 3p–3d configurations agree reasonably well, although values derived from the 3d–4f transitions, for which only preliminary effective recombination coefficients are available, tend to be higher by a factor of two than those derived from the 3–3 transitions – a pattern also seen in other nebulae analyzed by us previously. The ORL Ne^{2+}/H^+ abundance ratios of NGC 7009 are found to be higher by a factor of 4 than those derived from the optical collisionally excited lines [Ne III] $\lambda\lambda$3868, 3967 and from the infrared fine-structure lines [Ne III] 15.5- and 36-μm, similar to the patterns found for C, N and O, previously analyzed by Liu et al. (1995). The result is in line with the general conclusion that while the ratios of heavy element abundances, derived from ORLs on the one hand and from CELs on the other, vary from target to target and cover a wide range from unity to more than an order of magnitude, the discrepancy factor for the

individual elements, C, N, O and Ne, is found to be approximately the same magnitude *for a given nebula*, a result which may have a fundamental implication for understanding the underlying physical cause(s) of the large discrepancies between heavy element abundances derived from these two types of emission line. The result also indicates that while the absolute abundances of heavy elements relative to hydrogen remain uncertain, the abundance ratios of heavy elements, such as C/O, N/O and Ne/O, are probably secure, provided that the same type of emission line, i.e. ORLs or CELs, is used to determine the abundances of both heavy elements involved in the ratio.

For NGC 7009, the total neon abundances derived from the CELs and ORLs, on a logarithmic scale where H = 12.0, are 8.24 ± 0.08 and 8.84 ± 0.25, respectively. The later is about a factor of 5.5 higher than the solar neon abundance.

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Preprints can be retrieved from ftp://ftp.star.ucl.ac.uk/pub/xwl/
or by contacting X.-W. Liu at xwl@star.ucl.ac.uk

Chemical abundances of planetary nebulae from optical recombination lines – III. The Galactic bulge PN M 1-42 and M 2-36

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We present deep, high resolution optical spectra of two Galactic bulge planetary nebulae (PN), M 1-42 and M 2-36. The spectra show very prominent and rich optical recombination lines (ORLs) from C, N, O and Ne ions. Infrared spectra from 2.4–197 μm were also obtained using the Short and Long Wavelength Spectrometer (SWS and LWS) on board *ISO*. The optical and infrared spectra, together with archival IUE spectra, are used to study their density and thermal characteristics and to determine elemental abundances.

We determine the optical and UV extinction curve towards these two bulge PN using observed H I and He II recombination line fluxes and the radio free-free continuum flux density. In the optical, the reddening curve is found to be consistent with the standard Galactic extinction law, with a total to selective extinction ratio $R \equiv A(V)/E_{\rm B-V} = 3.1$. However, the extinction in the UV is found to be much steeper, consistent with the earlier finding of Walton, Barlow & Clegg (1993).

The rich ORL spectra from C, N, O and Ne ions detected from the two nebulae have been used to determine the abundances of these elements relative to hydrogen. In all cases, the resultant ORL abundances are found to be significantly higher than the corresponding values deduced from collisionally excited lines (CELs). In M 2-36, the discrepancies are about a factor of five for all four elements studied. In M 1-42, the discrepancies reach a factor of about twenty, the largest ever observed in a PN. M 1-42 also has the lowest Balmer jump temperature ever determined for a PN, $T_{\rm e}$(BJ) = 3560 K, 5660 K lower than its [O III] forbidden line temperature.

We compare the observed intensities of the strongest O II ORLs from different electronic configurations, including λ4649 from 3s–3p, λ4072 from 3p–3d, λ4089 from 3d–4f, and λ4590 and λ4190 from the doubly excited 3s′–3p′ and 3p′–3d′ configurations, respectively. In all cases, in spite of the fact that the ratios of the ORL to CEL ionic abundances span a wide range from ∼5–20, the intensity ratios of λ4649, λ4072, λ4590 and λ4190 relative to λ4089 are found to be nearly constant, apart from some small monotonic increase of these ratios as a function of electron temperature. Over a range of Balmer jump temperature from 3500–8100 K, the variations amount to about 20 per cent for the 3s–3p and 3p–3d transitions and a factor of two for the primed transitions, and are consistent with the predictions of current recombination theory. Our results do not support the claim by Dinerstein, Lafon & Garnett (2000) that the relative intensities of O II ORLs vary from nebula to nebula and that the scatter is largest in objects where the discrepancies between ORL and CEL abundances are also the largest.

We find that the ORL to CEL abundance ratio is highly correlated with the difference between the temperatures

yielded by the [O III] forbidden line ratio and by the H I Balmer jump, providing the strongest evidence so far that the two phenomena, i.e. the disparity between ORL and CEL temperature and abundance determinations, are closely related. However, temperature fluctuations of the type envisaged by Peimbert (1967) are unable to explain the low ionic abundances yielded by infrared fine-structure lines. The very low Balmer jump temperature of M 1-42, coupled with its very low Balmer decrement density, may also be difficult to explain with chemically inhomogeneous composite model of the type proposed by Liu et al. (2000) for NGC 6153.

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Preprints can be retrieved from ftp://ftp.star.ucl.ac.uk/pub/xwl/ or by contacting X.-W. Liu at xwl@star.ucl.ac.uk

SiO maser survey of AGB stars in the North Galactic Cap

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A SiO maser survey in the J=1-0, v=1 and 2 transitions has been made for IRAS sources in the North Galactic Cap ($b > 30°$) with the Nobeyama 45m radio telescope. The sources were selected on the basis of their IRAS 12/25-μm and 25/60-μm flux ratios as likely oxygen-rich AGB candidates. SiO masers were detected from 24 out of the 97 selected sources, where 17 were new detections. The distances and heights above the Galactic plane are calculated. The Galactic distribution of detected and undetected stars indicates that metallicity is likely to govern the detection rate. The Galactocentric angular velocities of the subsampled stars are derived and their variation with the Galactic height is discussed.

Accepted by A&A

Preprints can be obtained by yita@mtk.ioa.s.u-tokyo.ac.jp *contacting* Y. Ita: yita@mtk.ioa.s.u-tokyo.ac.jp

Testing Nucleosynthesis Theory Of Sulfur, Chlorine, and Argon Using Planetary Nebulae. I: Observations and Abundances in a Northern Sample

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This paper is the first of a series specifically studying the abundances of sulfur, chlorine, and argon in Type II planetary nebulae (PNe) in the Galactic disk. Ratios of S/O, Cl/O, and Ar/O constitute important tests of differential nucleosynthesis of these elements and serve as strict constraints on massive star yield predictions. We present new ground-based optical spectra extending from 3600-9600Å for a sample of 19 Type II northern PNe. This range includes the strong near infrared lines of [S III] $\lambda\lambda$9069,9532, which allows us to test extensively their effectiveness as sulfur abundance indicators. We also introduce a new, model-tested ionization correction

factor for sulfur. For the present sample, we find average values of S/O=1.2E-2±0.71E-2, Cl/O=3.3E-4±1.6E-4, and Ar/O=5.0E-3±1.9E-3.

Accepted by The Astrophysical Journal

Preprints can be obtained at http://xxx.lanl.gov/abs/astro-ph/0106213

Mid-IR Observations of Mira Circumstellar Environment

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This paper presents results from high-angular resolution mid-IR imaging of the Mira AB circumbinary environment using the MIRAC3 camera at the NASA Infrared Telescope Facility (IRTF). We resolved the dusty circumstellar envelope at 9.8, 11.7 and 18 μm around Mira A (o Ceti), and measured the size of the extended emission. Strong deviations from spherical symmetry are detected in the images of Mira AB system, including possible dust clumps in the direction of the companion (Mira B). These observations suggest that Mira B plays an active role in shaping the morphology of the circumstellar environment of Mira A as it evolves toward the Planetary Nebula phase.

Accepted by ApJ Letters

Preprints can be obtained by contacting mmarengo@cfa.harvard.edu *or via WWW on* http://arXiv.org/abs/astro-ph/0106344

An analysis of the observed radio emission from planetary nebulae

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We have analysed the radio fluxes for 264 planetary nebulae for which reliable measurements of fluxes at 1.4 and 5 GHz, and of nebular diameters are available. For many of the investigated nebulae the optical thickness is important, especially at 1.4 GHz. Simple models like the one specified only by a single optical thickness or spherical, constant density shells do not account satisfactorily for the observations. Also an r^{-2} density distribution is ruled out. A reasonable representation of the observations can be obtained by a two-component model having regions of two different values of optical thickness. We show that the nebular diameters smaller than 10 arcsec are uncertain, particularly if they come from photographic plates or gaussian fitting to the radio profile. While determining the interstellar extinction from an optical to radio flux ratio caution should be paid to optical thickness effects in the radio. We have developed a method for estimating the value of self absorption. At 1.4 GHz self absorption of the flux is usually important and can exceed a factor of 10. At 5 GHz self absorption is negligible for most of the objects although in some cases it can reach a factor of 2. The Galactic bulge planetary nebulae when used to calibrate the Shklovsky method give the mean nebular mass of 0.14 $M_{\odot}$. The statistical uncertainty of the Shklovsky distances is smaller than factor 1.5.

Accepted by Astronomy & Astrophysics

Preprints can be obtained by contacting alexan@ncac.torun.pl *or via WWW on* http://arXiv.org/abs/astro-ph/0105303

High-resolution imaging of proto-planetary nebulae: the effects of orientation

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Deep *HST* F814W images were obtained of six proto-planetary nebulae (PPNs), each of which shows a bipolar morphology but with a difference in orientation. Two of these (IRAS 17245−3951 and IRAS 22574+6609) show a dark lane separating bipolar lobes, and appear to be seen approximately edge-on. The other four (IRAS 16594−4656, IRAS 17106−3046, IRAS 19477+2401, and IRAS 20028+3910) appear to be at intermediate orientations, and in all but one case the central star is seen. In addition, one bright PPN (IRAS 20136+1309) was observed that is slightly extended, and we suggest that it may be a bipolar nebula seen pole-on. Visible-band *HST* images also exist for six of these, and with these color images were formed and analyzed. New ground-based photometry was combined with satellite data to delineate the spectral energy distribution (SED) from 0.5 to 100 μm for each of these. The orientation effects on the optical morphologies and the SEDs are discussed. In general the ratio of dust to photospheric flux is higher as the orientation increases toward edge-on, although there are some exceptions. Some numerical models were constructed and used to show quantitatively the effects that differences in the asymmetry of the circumstellar envelope or in the size of the cavity opening angle can have on this ratio. The general differences in appearance and SED of these PPNs are attributed primarily to the different viewing orientations. These results, when combined with those of previous imaging studies of PPNs, strengthen the idea that PPNs possess a basic bipolar structure due to an asymmetric circumstellar dust shell.

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Preprints can be obtained by contacting kate.su@valpo.edu

Infrared optical properties of spinels

A study of the carrier of the 13, 17 and 32 μm emission features observed in ISO-SWS spectra of oxygen-rich AGB stars

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In a previous paper, we have proposed magnesium aluminium spinel to be the carrier of the 13 and 17 μm band features observed in the ISO spectra of some red giants. The IR optical properties of spinel strongly depend on its chemistry and its internal structure. To study the dependence of spinel's IR-spectra on its aluminium content, we have synthesized a number of crystals with different Al/Mg-ratios. Additionally, we performed an annealing experiment to investigate the phase transition between ordered and partially disordered spinel taking place at about 1200 K. We derived sets of optical constants of our natural, annealed and synthetic spinels in order to calculate the absorption efficiencies of small (sub-μm-sized) spherical particles. Thereby, it turned out that natural as well as near-stoichiometric synthetic spinel can indeed be considered as a suitable candidate for the carrier of the 13 μm feature observed in the spectra of some oxygen rich circumstellar shells. To illustrate this, we reinvestigated the mean profile of the residual dust emission in the 12–18 μm wavelength range (i. e., in the so-called trough region between the two silicate bands). The reality of the emission feature at 16.8 μm is confirmed by our new investigation. We demonstrated that it is not an instrumental artifact since it is not present in ISO spectra of K-stars. In the course of our laboratory work, we found a third prominent emissivity maximum of spinel at 32 μm. This feature could also be detected in the spectra of the brightest 13 μm band emission sources; we derived its mean band profile, too. The new sets of optical constants here presented have been made available for public access in the electronic database `http://www.astro.uni-jena.de`.

Accepted by A&A

Preprints can be obtained by posch@astro.univie.ac.at *or via WWW on* http://www.astro.univie.ac.at/~fzi/spinel.ps

Multi-colour light variation of AGB stars observed with ISO

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New visual light curves and infrared multi-epoch photometry are presented for a sample of AGB-stars spectroscopically observed with ISO. While the ISO work is or will be presented elsewhere, the aim of this paper is to give an overview of the properties of the light change of the objects. This information is crucial for the interpretation of the valuable ISO material.

Using the University of Vienna Twin Automatic Photoelectric Telescope (APT) we monitored the stars of our sample in the photometric bands V and I_C. We present the light curve of each object and derive the parameters of the current light change, such as period(s) and amplitude. Furthermore we give V$-$$I_C$ colours and colour variations for these objects.

Our results allow us to derive some general results on semiregular and irregular variables. Only in less than 50% of the cases could we confirm the GCVS period. Moreover, we did not find any pronounced difference between SRb and Lb variables in the regularity of the light curve. The existence of rapid oscillations indicated by Hipparcos data could not be confirmed.

In addition to the visual light changes we present new near infrared photometry data. Although typically only few data points are available, they can be viewed relative to the better-monitored visual light curves providing information on possible phase shifts and differences in amplitude in different parts of the spectrum. Furthermore, multi-epoch photometry allows us to derive mean colours for these objects.

Accepted by Astronomy & Astrophysics

Preprints can be obtained by contacting kerschbaum@astro.univie.ac.at

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Second Announcement
IAU SYMPOSIUM 209

Planetary Nebulae:
Their Evolution and Role in the Universe

November 19-23, 2001, Canberra, Australia
Web site: http://www.mso.anu.edu.au/~pn_symp

PRELIMINARY SCIENTIFIC PROGRAMME
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(Only invited speakers are listed at this stage)

November 19, 0900

Session 1: PN surveys and their distribution in the galaxies

Introduction and summary of current problems in PN research: S. Kwok
History: L. Aller
Surveys & Classification: new PN from emission-line surveys: Q. Parker

Session 2: PN in the scheme of stellar evolution

Current models for the evolution of AGB stars F. Herwig
Nucleosynthesis and dredge up of heavy elements: J. Lattanzio
s-process elements in post-AGB stars: H. Van Winckel
Proto-planetary nebulae: B. Hrivnak
PN in the scheme of binary evolution: N. Soker

Poster session

November 20, 0900
H- and He-burning central stars and the evolution to white dwarfs: T. Blocker
The formation and evolution of PN: D. Schoenberner
Observed evolution of the nebulae and central stars: R. Tylenda

Session 3: Central stars and their atmospheres

Non-LTE models of CSPN: K. Werner
Stellar winds from the central stars: A. Pauldrach
WR central stars: W. Hamann
Abundance analysis with WC atmsophere models: O. DeMarco
PN and WR nebulae: Y. Grosdidier
Binary central stars: H. Bond

Session 4: Dust and Molecules in PN

ISO spectroscopy of molecules in PN and PPN: J. Cernicharo

Poster session

November 21, 0900

Photochemistry in PN: T. Hasegawa
IR features in PN: K. Volk
Laboratory identification of IR features: O. Guillois
Crystalline silicates: F.J. Molster

Session 5: Observations of the Ionized Gas

Atomic processes in PN: S. Nahar
Chemical abundances in PN: S. Torres-Peimbert
Chemical abundances from ISO results: S. Pottasch
IR collisionally excited lines: X. Liu
Abundances from recombination lines: H. Dinerstein

Lunch and Excursion

November 22, 0900

FUSE observations of PN: G. Sonneborn
X-ray and UV views of the hot gas in PN: Y.-H. Chu

Session 6: Nebular Morphology and Dynamics

PN morphology and correlation with PN parameters: A. Manchado
Dynamical evolution of PN: B. Balick
Structure and evolution of PN haloes: M. Steffen
MHD models of PN: G. Garcia-Segura
Multi-polar structures in PN: R. Sahai
Collimated outflows in PN: J. Lopez

Poster session

November 22, 0900

Session 7: PN as galaxy probes

PN & galactic chemical evolution: W. Maciel
PN in the Magellanic Clouds: L. Stanghellini
PN as tracers of chemical evolution of external galaxies: M. McCall
Intracluster PN: J. Feldmeier
Observational aspects of galaxy dynamics using PN: M. Arnaboldi
PN as an extragalatic distance indicator: R. Ciardullo
PN as tracers of dark matter in galaxies & clusters: K. Freeman

Conference Summary and closing remarks: M. Dopita
General discussion

Conference ends at 4pm Friday.

IMPORTANT DATES
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 1 Dec 2000 1st Announcement
 1 Mar 2001 Deadline for pre-registrations

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 1 May 2001  Deadline for travel grant applications
15 May 2001  2nd Announcement
15 Sep 2001  Deadline for registration
15 Oct 2001  Deadline for abstracts, Final announcement

18 Nov 2001  Reception
19 Nov 2001  Conference starts
20 Nov 2001  Wine tasting
21 Nov 2001  Organized afternoon activities
22 Nov 2001  Conference dinner
23 Nov 2001  Conference ends

The Scientific Organizing Committee:
A. Acker (France), M. Arnaboldi (Italy), B. Balick (U.S.A.), M.  Barlow (U.K.),
M. Dopita (Australia, co-chair), S. Deguchi (Japan), G. Jacoby (U.S.A.),
S. Kwok (Canada, co-chair), W.J. Maciel (Brazil), A. Manchado (Spain),
M. Perinotto (Italy), S.R. Pottasch (The Netherlands), D. Schoenberner
(Germany), Y. Terzian (U.S.A.), S. Torres-Peimbert (Mexico), R. Tylenda
(Poland), P.R. Wood (Australia)

The Local Organising Committee:
M. Dopita, M. Sevenster, C. Jackson, P. McGregor, R. Sutherland & P. Wood
(all at RSAA)
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Workshop on MASS-LOSING PULSATING STARS AND THEIR CIRCUMSTELLAR MATTER

We are very pleased to announce an international workshop on "Mass-losing Pulsating Stars and Their Circumstellar Matter" to be held **in Sendai, Japan, on May 13-16, 2002**.

New observational technology has revealed many unexpected views of astronomical objects. This is especially true in the field of the stellar astrophysics. Large-scale optical and near infrared surveys and the radio observations of maser sources have given many new insights about mass-losing pulsating stars. In Japan, a net work of VLBI, the VERA project, was recently funded. The VERA will be used to measure the accurate positions of many AGB maser sources. In spite of these new observational discoveries, however, some old and fundamental problems like the role of the stellar pulsation in mass-loss process still remain unresolved. Our workshop is planned to confront the new observational facts with the theoretical results. Implications of the new photometric studies and the high precision interferometric measurements of radio objects will be fully discussed. Since the AGB stars are often the brightest stars in the Galaxy, the study of these stars will be also useful to investigate the structure of the Galaxy and the mass distribution in nearby galaxies. The purpose of this workshop is not only to develop the stellar physics but also to study the structure and history of galaxies.

SCIENTIFIC ORGANIZING COMMITTEE S.H. Cho(Korea), S. Deguchi(Japan), K.Y. Lo(China R), Y. Muraki (Japan), Y. Nakada(Japan), M.J. Reid(USA), T. Sasao(Japan), M. Takeuti(Japan, chair), H.J. van Langevelde(The Netherlands), C. Waelkens(Belgium), P.A. Whitelock(South Africa), A. Winnberg (Sweden), P.R. Wood(Australia)

If you are interested in attending the workshop, please visit http://www.astr.tohoku.ac.jp/ws2002/

contacting E-mail: wsloc@astr.tohoku.ac.jp
WWW *or via WWW on* http://www.astr.tohoku.ac.jp/ws2002/