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Abstract of recently accepted papers

An estimate of the time variation of the O/H radial gradient from planetary nebulae

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Radial abundance gradients are a common feature of spiral galaxies, and in the case of the Galaxy both the magnitude of the gradients and their variations are among the most important constraints of chemical evolution models. Planetary nebulae (PN) are particularly interesting objects to study the gradients and their variations. Owing to their bright emission spectra, they can be observed even at large galactocentric distances, and the derived abundances are relatively accurate, with uncertainties of about 0.1 to 0.2 dex, particularly for the elements that are not synthesized in their progenitor stars. On the other hand, as the offspring of intermediate mass stars, with main sequence masses in the interval of 1 to 8 solar masses, they are representative of objects with a reasonable age span. In this paper, we present an estimate of the time variation of the O/H radial gradient in a sample containing over 200 nebulae with accurate abundances. Our results are consistent with a flattening of the O/H gradient roughly from -0.11 dex/kpc to -0.06 dex/kpc during the last 9 Gyr, or from -0.08 dex/kpc to -0.06 dex/kpc during the last 5 Gyr.

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Dynamic model atmospheres of AGB stars III. Effects of frequency-dependent radiative transfer

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We present a new generation of model atmospheres for AGB stars which combine time-dependent dynamics and frequency-dependent radiative transfer. This allows us to take both the effects of pulsation (shock waves, stellar winds) and the complex influence of molecular opacities into account. In the case of C-rich stars, the

models also include a self-consistent time-dependent description of dust formation. We investigate the influence of frequency-dependent radiative transfer on the energy and momentum balance of the atmosphere and compare our new models to existing grey dynamical models as well as to classical hydrostatic model atmospheres. We stress the importance of non–grey radiative transfer for obtaining realistic density–temperature structures even in highly dynamical models, discussing both the resulting observable properties and the wind characteristics. Presenting synthetic spectra, we argue that the current dynamical models represent an important step in a process leading from a qualitative to a quantitative description of atmospheres and winds of pulsating AGB stars.

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Ram pressure stripping in Planetary Nebulae.

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We present two-dimensional numerical simulations of the evolution of a low-mass star moving supersonically through its surrounding interstellar medium (ISM). We show that the ejecta of a moving star with a systemic velocity of 20 km s−1 will interact with the ISM and will form bow-shock structures qualitatively similar to what is observed. We find that, due to ram-pressure stripping, most of the mass ejected during the AGB phase is left downstream of the moving star. As a consequence, the formation of the PN is highly influenced, even at the low relative velocity of the star. The models are based on the predictions of stellar evolution calculations. Therefore, the density and velocity of the AGB and post-AGB winds are time dependent and give rise to the formation of shock regions inside the cavity formed by the previous winds. As a result, the stand-off distance is also time dependent and cannot be determined by simple analytical arguments.

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Preprints can be obtained by contacting villaver@stsci.edu
Also available from the URL http://arXiv.org/abs/astro-ph/0301307

Shaping Proto-Planetary and Young Planetary Nebulae with Collimated Fast Winds

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Using two-dimensional hydrodynamical simulations, we investigate the interaction of a collimated fast wind (CFW) interacting with a spherical asymptotic giant branch (AGB) wind as the mechanism for shaping proto-planetary nebulae and young planetary nebulae. In particular, we compare our simulations to the observations of an evolved PPN with multiple, highly collimated lobes, CRL 618. We characterize our model CFW by three parameters: opening angle, velocity and mass-loss rate, and explore the dependence of the properties of the shell on the first two. For given opening angle and velocity, the mass-loss rate is chosen to give a shell velocity of about 150 km s^{-1} at the tip, similar to that seen in CRL 618. In our simulations, the shell dynamics is found to depend on the velocity of the fast wind: we obtain a momentum-driven shell for a 300 km s^{-1} fast wind and a ballistic bow-shock driven shell for a 1000 km s^{-1} fast wind. The shell driven by the collimated fast wind is highly collimated, even though the AGB wind is spherical. Time variations in the velocity of the fast wind

produce a series of internal shock pairs interacting with the inner surface of the shell. Due to radial expansion, the density of the internal shocks decreases with distance.

Various emission diagnostics have been derived from our simulations. For a 300 km s^{-1} fast wind, the optical emission arises from both the shocked AGB wind and shocked fast wind, showing one or two bright bow-like structures at the tip of the lobe. However, for a 1000 km s^{-1} fast wind, since the shocked fast wind is much hotter, it emits mainly in X-ray emission; the optical emission forms only one bow-like structure at the tip associated with the shocked AGB wind. The position-velocity (PV) diagrams derived from our simulations all show a broad range of velocities at the tip. The detailed PV structure and velocity range at the tip depend on the shell dynamics and the relative contributions of the shocked fast wind and shocked AGB wind.

We make a detailed comparison of our simulations to the observations of the relatively isolated northwestern (W1) lobe of CRL 618. We find that a 300 km s^{-1} collimated fast wind with an opening angle of 10° can readily produce a highly collimated lobe similar to the W1 lobe, including the bow-like emission structure at its tip. However, our models have difficulty producing the bright emission structures seen along the body of the lobe. The [SII]λ6716Å/λ6730Å ratios at the tip of the lobe in all of our simulations are similar to that observed at the tip of the W1 lobe. The optical line ratios indicate a temperature stratification in the tip, both for the simulations and observations, however, the temperatures at the tip of the lobe in our simulations are higher than observed. The position-velocity (PV) diagrams derived from our simulations are all qualitatively consistent with the current observations. The collimated fast wind in CRL 618 is unlikely to be steady and is not radiatively driven.

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Preprints can be obtained by contacting chinfei@eclipse.jpl.nasa.gov
or via WWW on http://arxiv.org/abs/astro-ph/0211510

Optical polarization and near IR photometry of the proto-planetary nebula Hen 3-1475

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We present BVRI CCD aperture polarization and near-infrared photometry of the proto-planetary nebula Hen 3-1475. Its intrinsic polarization is high and shows a strong spectral dependence. The position angles in all bands are perpendicular to the axis of the observed bipolar structure. A Monte Carlo code is used to model the intrinsic polarization of Hen 3-1475. Using disk dimensions and other constraints suggested by previous works, we are able to reproduce the observations with an optically thick disk composed by grains with a power-law size distribution ranging from 0.06 to 0.22 μm. We also reliably estimate the foreground polarization from hundreds of stars contained in the CCD images. It is parallel to the intrinsic polarization of Hen 3-1475. Possible implications of this result are discussed. From IR observations, we estimate a interstellar reddening, A_V, of about 3.2.

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Imaging polarimetry of stellar light scattered in detached shells around the carbon stars R Scl and U Ant

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Imaging polarimetry has been used to study the extended, detached circumstellar shells around the bright carbon stars R Scl and U Ant. The observations were done in two narrow band filters centred on the resonance lines of neutral K and Na, but much broader than the expected line widths. The polarimetric data reveal brightness distributions, in both cases, which are in perfect agreement with previous observations of scattered light obtained through direct imaging techniques. The total intensity images towards R Scl outline, in both filters, circular disk-like distributions out to a radius of ≈21", where the intensity drops sharply. The polarised intensity images reveal, however, that the scattering occurs in a geometrically thin shell. The degree of polarisation reaches values of ≈35% in both filters. The imaging polarimetry observations of U Ant reveal a somewhat more complex structure, where the existence of several shells can be discerned. The polarised scattered light comes from a component, at a radius of ≈50" from the star, which lies outside the region where the bulk of the light is scattered. The latter comes from a dominating shell at ≈43", which coincides spatially with the detached gas shell inferred from CO radio line data, and there may be another two shells inside this. The polarisation degree reaches ≈50% in the outer component. We model, with a code based on the Monte Carlo method, the scattered emission under the assumption of dust scattering, using the observed polarised brightness distributions as constraints. In the case of R Scl we found that the polarised, as well as the total, light distributions can be explained by scattering in a 2" wide shell of radius 20" containing a dust mass of $\approx 2\times10^{-6}$ $M_\odot$. This dust shell is also responsible for the thermal dust emission measured by IRAS. There is room, up to 30% of the total scattered flux, for other scattering agents. Comparison with CO radio line data shows that this dust shell probably lies outside the detached CO gas shell. In the case of U Ant the modelling explains the outer component in terms of a 5" wide shell at a radius of about 52" with a dust mass of $\approx 4\times10^{-6}$ $M_\odot$. This is also the dust shell responsible for the emission measured by IRAS. However, the bulk of the scattered light cannot in this case be due to scattering by dust. In accordance with a discussion in a previous paper we attribute the remaining, unpolarised, scattering to the KI and Na D resonance lines. In both cases we found evidence that a dust shell has separated from the rest of the circumstellar medium. This may be due to gas-grain drift, or to hydrodynamical effects, which may also explain the complex multiple-shell structure seen towards U Ant. The model results are very dependent on the grain size distribution, and the observational data can only be reconciled with a very steep decline in grain size.

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Mocassin: A fully three-dimensional Monte Carlo photoionization code

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The study of photoionized environments is fundamental to many astrophysical problems. Up to the present most photoionization codes have numerically solved the equations of radiative transfer by making the extreme

simplifying assumption of spherical symmetry. Unfortunately very few real astronomical nebulae satisfy this requirement. To remedy these shortcomings, a self-consistent, three-dimensional radiative transfer code has been developed using Monte Carlo techniques. The code, Mocassin, is designed to build realistic models of photoionized nebulae having arbitrary geometry and density distributions, with both the stellar and diffuse radiation fields treated self-consistently. In addition, the code is capable of treating ones or more exciting stars located at non-central locations.

The gaseous region is approximated by a cuboidal Cartesian grid composed of numerous cells. The physical conditions within each grid cell are determined by solving the thermal equilibrium and ionization balance equations. This requires a knowledge of the local primary and secondary radiation fields, which are calculated self-consistently by locally simulating the individual processes of ionization and recombination. The structure and the computational methods used in the Mocassin code are described in this paper.

Mocassin has been benchmarked against established one-dimensional spherically symmetric codes for a number of standard cases, as defined by the Lexington/Meudon photoionization workshops Péquignot et al. (1986), Ferland et al. (1995) and Péquignot et al. (2001). The results obtained for the benchmark cases are satisfactory and are presented in this paper. A performance analysis has also been carried out and is discussed here.

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Three-dimensional photoionization modelling of the planetary nebula NGC 3918

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The three-dimensional Monte Carlo photoionization code Mocassin has been applied to construct a realistic model of the planetary nebula NGC 3918. Three different geometric models were tried, the first being the biconical density distribution already used by Clegg et al. (1987). In this model the nebula is approximated by a biconical structure of enhanced density, embedded in a lower density spherical region. Spindle-like density distributions were used for the other two models (models A and B). Model A used a mass distribution slightly modified from one of Mellema's (1996) hydrodynamical models that had already been adopted by Corradi et al. (1999) for their observational analysis of NGC 3918. Our spindle-like model B instead used an analytical expression to describe the shape of the inner shell of this object as consisting of an ellipsoid embedded in a sphere.

The effects of the interaction of the diffuse fields coming from two adjacent regions of different densities were investigated. These are found to be non-negligible, even for the relatively uncomplicated case of a biconical geometry. We found that the ionization structure of low ionization species near the boundaries is particularly affected.

It is found that all three models provided acceptable matches to the integrated nebular optical and ultraviolet spectrum. Large discrepancies were found between all of the model predictions of infrared fine-structure line fluxes and *ISO SWS* measurements. This was found to be largely due to an offset of $\approx$14 arcsec from the centre of the nebula that affected all of the *ISO* observations of NGC 3918.

For each model, we also produced projected emission-line maps and position-velocity diagrams from synthetic long-slit spectra, which could be compared to recent *HST* images and ground-based long-slit echelle spectra. This comparison showed that spindle-like model B provided the best match to the observations. Although the

integrated emission line spectrum of NGC 3918 can be reproduced by all three of the three-dimensional models investigated in this work, the capability of creating projected emission-line maps and position-velocity diagrams from synthetic long-slit spectra was found to be crucial in allowing us to constrain the structure of this object.

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Physical conditions in the planetary nebula Abell 30

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We have analysed optical spectra of two of the hydrogen-deficient knots (J1 & J3) in the born-again planetary nebula Abell 30, together with UV spectra of knots J3 & J4. We determine electron temperatures in the knots based on several diagnostics. The [O III] nebular-to-auroral transition ratio yields temperatures of the order of 17 000 K. The weak temperature dependence of the ratios of helium lines λ4471, λ5876 and λ6678 is used to derive a temperature of 8850 K for knot J3 and 4600 K for knot J1. Ratios of O II recombination lines, which directly measure the temperature in the coldest regions of the knots, are used to derive temperatures of 2500 K for knot J3, and just 500 K for knot J1.

We calculate abundances both from collisionally excited lines and from the well-observed recombination spectra of C, N, O and Ne ions. The forbidden line abundances agree well with previous determinations, but the recombination line abundances are several hundred times higher. These results confirm the scenario proposed by Harrington and Feibelman (1984) in which the knots contain a cold core highly enriched in heavy elements. Forbidden lines are almost entirely emitted by the hot outer part of the knot, while recombination lines are emitted predominantly from the cold core. The C/O ratios we derive imply that the knots are oxygen-rich, contrary to theoretical predictions for born-again nebulae (Iben et al 1983).

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Detection of a second, strong submillimeter HCN laser line towards carbon stars

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We have searched for and found strong laser action at a frequency near 891 GHz in the J=10–9 transition between the (11^0) and (04^00) vibrationally excited states of HCN toward the mass-losing carbon stars IRC+10216, CIT6, and Y CVn. This line is part of a Coriolis-coupled system that has been well-studied in the laboratory during the early years of molecular laser spectroscopy. This system also includes the 805 GHz J=9–8 transition within the (04^00) state, which was discovered toward IRC+10216 by Schilke, Mehringer & Menten (2000) and which we also find to be lasing in CIT6. Toward both stars, the 891 GHz line is about an order of magnitude stronger than the 805 GHz line and observations spaced about half a year apart provide clear evidence for temporal variability. As was concluded for the latter, given that the lines' lower energy levels are 4200 K over the ground state, they

must arise from the innermost parts of the stars' circumstellar envelopes. Future high resolution interferometric observations with the Atacama Large Millimeter Array of the HCN laser lines will yield important information on the dust formation zone of carbon stars.

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Physical conditions in the Protoplanetary Nebula CRL 618 derived from observations of vibrationally excited HC_3N

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We used the Effelsberg 100 m and IRAM 30 m telescopes to observe vibrationally excited cyanoacetylene (HC_3N) in several rotational transitions toward the proto-planetary nebula CRL 618. Lines from 9 different vibrationally excited states with energies ranging up to 1600 K above ground were detected. The lines show P Cygni profiles indicating that the HC_3N emission originates from an expanding and accelerating molecular envelope. The HC_3N rotational temperature varies with velocity, peaks at 520 K, 3 km s^{-1} blue-shifted from the systemic velocity and decreases with higher blueshift of the gas. The column density of the absorbing HC_3N is 3–6$\times 10^{17}$ cm^{-2}. We modeled spectra based on spherical models of the expanding envelope which provide an excellent fit to the observations, and discuss the implications of the models. Additionally, lines from ^{13}C substituted cyanoacetylene were observed. They can be used to constrain the $^{12}C/^{13}C$ ratio in this source to 10 ± 2.

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Discovery of Multiple Molecular Shells in the Outer Envelope of IRC+10216

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We present ^{12}CO $J = 1 \rightarrow 0$ maps of the extended envelope of IRC+10216 made by combining BIMA Millimeter Array and NRAO 12m telescope observations. CO emission was detected beyond the radius of 140 arcsec which traces the history of mass loss for the past $\sim$ 7000 yr. We discover superposed on the CO envelope clumpy arcs of enhanced emission, circumscribing the star, at multiple radii ranging from about 26 arcsec to 120 arcsec. The arcs are found to be coherent across a range of velocities, thus forming sections of multiple shells that are participating in the circumstellar expansion. The intershell timescales range from 1300-2900 yr, which are roughly consistent with simulations where wind modulations from a single thermal pulse event can lead to the formation of multiple shells. The multiple enhanced shells within the continuous envelope of IRC+10216 may be the high mass loss rate counterpart to the detached shells detected around several low mass loss rate carbon stars, such as TT Cyg.

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Molecular abundances in carbon-rich circumstellar envelopes

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A millimetre molecular line survey of seven high mass-loss rate carbon stars in both the northern and southern skies is presented. A total of 196 emission lines (47 transitions) from 24 molecular species were detected. The observed CO emission is used to determine mass-loss rates and the physical structure of the circumstellar envelope, such as the density and temperature structure, using a detailed radiative transfer analysis. This enables abundances for the remaining molecular species to be determined. The derived abundances generally vary between the sources by no more than a factor of five indicating that circumstellar envelopes around carbon stars with high mass-loss rates have similar chemical compositions. However, there are some notable exceptions. The most striking difference between the abundances are reflecting the spread in the $^{12}C/^{13}C$-ratio of about an order of magnitude between the sample stars, which mainly shows the results of nucleosynthesis. The abundance of SiO also shows a variation of more than an order of magnitude between the sources and is on the average more than an order of magnitude more abundant than predicted from photospheric chemistry in thermal equilibrium. The over-abundance of SiO is consistent with dynamical modelling of the stellar atmosphere and the inner parts of the wind where a pulsation-driven shock has passed. This scenario is possibly further substantiated by the relatively low amount of CS present in the envelopes. The chemistry occurring in the outer envelope is consistent with current photochemical models.

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Preprints can be obtained by contacting pwoods@eso.org
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Ionized haloes in planetary nebulae: new discoveries, literature compilation and basic statistical properties

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We present a comprehensive observational study of haloes around planetary nebulae (PNe). Deep Hα+[NII] and/or [OIII] narrowband images were obtained for 35 PNe, and faint extended haloes were newly discovered in the following 10 objects: Cn 1-5, IC 2165, IC 2553, NGC 2792, NGC 2867, NGC 3918, NGC 5979, NGC 6578, PB 4, and possibly IC 1747. New deep images were also obtained of other known or suspected haloes, including the huge extended emission around NGC 3242 and Sh 2-200. In addition, the literature was searched, and together with the new observations an improved database containing some 50 PN haloes has been compiled.

The halo sample is illustrated in an image atlas contained in this paper, and the original images are made available for use by the scientific community at *http://www.ing.iac.es/~rcorradi/HALOES/*.
The haloes have been classified following the predictions of modern radiation-hydrodynamical simulations that describe the formation and evolution of ionized multiple shells and haloes around PNe. According to the models, the observed haloes have been divided into the following groups: *i)* circular or slightly elliptical *AGB haloes*, which contain the signature of the last thermal pulse on the AGB; *ii)* highly asymmetrical AGB haloes; *iii)* candidate *recombination haloes*, i.e. limb-brightened extended shells that are expected to be produced by recombination during the late post-AGB evolution, when the luminosity of the central star drops rapidly by a significant factor; *iv) uncertain cases*, that deserve further study for a reliable classification, and *v) non-detections*, i.e. PNe in which no halo is found to a level of $\leq 10^{-3}$ the peak surface brightness of the inner nebulae.
The properties of the haloes – detection rate, morphology, location of the central stars in the HR diagram, sizes, surface brightness profiles, and kinematical ages – are discussed. Among the most notable results we find that, as predicted by models, ionized AGB haloes are a quite common phenomenon in PNe, having being found in 60% of elliptical PNe for which adequately deep images exist. Another 10% show possible recombination haloes. In addition, using the kinematical ages of the haloes and inner nebulae, we conclude that most of the PNe with observed AGB haloes have left the AGB far from a thermal pulse, at a phase when hydrogen burning is the dominant energy source. We find no significant differences between the AGB haloes of hydrogen-poor and hydrogen-rich central stars.

Accepted by M.N.R.A.S.

Preprints can be obtained by contacting rcorradi@ing.iac.es
or via WWW on http://www.ing.iac.es/~rcorradi/HALOES/

Abstract of recently completed dissertations

High Resolution Spectroscopy of Post-AGB Stars: AGB Nucleosynthesis and Dredge-up

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Ph.D dissertation directed by: dr. Hans Van Winckel

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The final evolutionary stage of a low mass stellar object is a complex phase which is still poorly understood. In this thesis we contribute to a better understanding of the nucleosynthesis and dredge-up phenomena that occur in such objects during their ascent on the AGB by means of a detailed study of high-resolution optical spectra of post-AGB objects.

In the first four chapters we mainly focus on the photospheric abundances of eight carbon and s-process enriched post-AGB objects. The carbon enrichment clearly proves that products of the helium burning shell were brought to the surface in the so-called "third dredge-up". Moreover, also products of the (slow) neutron nucleosynthesis (the s-process) are brought to the surface, which allows us to characterize this nucleosynthesis. A detailed study of the chemical pattern displayed by these elements, including a comparison with up-to-date nucleosynthetic AGB stellar models, reveals that the expected anti-correlation between metallicity and neutron nucleosynthesis efficiency is hardly seen (if at all). The anti-correlation is expected since in a lower metallicity object, more neutrons are available per iron seed and hence heavier nucleons can be built up, assuming a similar primary production rate of the neutrons. Instead, a large spread in efficiency is seen. On the other hand, a clear correlation was found between the total enrichment and the nucleosynthesis efficiency, indicating that the dredge-up efficiency is strongly linked to the neutron production. Furthermore, detailed abundances of elements beyond the Ba-peak (Gd, Yb, Lu and possibly W) were obtained for the first time in intrinsically enriched objects for three stars of the sample, a result which was possible due to the combination of the high quality VLT+UVES spectra and newly released atomic data in both VALD and DREAM (Database on Rare Earths At Mons University). Finally, a new identification was found for the line at 6708 Å in the spectra of the enriched objects. This line was previously identified as the lithium resonance line, but we propose that it is due to a Ce II transition, implying that there is no need to invoke a lithium producing scenario for these objects.

In the last two chapters an extensive observational study is given of two remarkable lithium rich objects: HD 172481 and HD 190390 (HR 7671). The former turns out to be a highly exceptional double lined spectroscopic binary, consisting of a F-type post-AGB star and a M-type AGB star. For the latter, a conclusive evolutionary status is not found, but in the variability analysis of this object, we found evidence for a beating and a slight frequency increase. The genuine high lithium content of these two objects is not understood.

Job opportunity

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Attention: Dr. Margaret Meixner

Applications are invited for a postdoctoral research position at the Space Telescope Science Institute starting as early as summer 2003. The successful applicant will work with Dr. Margaret Meixner and collaborators on studies of circumstellar dust shells found around main sequence stars, pre-main sequence stars and evolved stars. This research will involve observations with HST, SIRTF, and ground based facilities. Independent research in related areas will be supported and encouraged. Research experience in the areas of planet formation, star formation, evolved stars, dust or radiative transfer is desirable. A PhD in astronomy or astrophysics is required.

The position is for two years, with a possible renewal for a third year. STScI, located on Johns Hopkins University Campus in Baltimore, Maryland, offers an excellent benefit package, competitive salaries, and a stimulating work environment. The minimum salary is $41,900; however, STScI's pay is commensurate to the year of Ph.D.

Applicants should send a cover letter with position applying for, curriculum vitae, list of publications, and a brief statement of research interests, accomplishments, and relevant technical expertise to the address above or email to meixner@stsci.edu, please cc: mccarty@stsci.edu. They should also arrange for three letters of recommendation to be sent directly to the same address. Completed applications received by 15 March 2003 are assured of full consideration. EOE/AA/M/F/D/V

Workshop announcement

ESO-Workshop on High Resolution Infrared Spectroscopy in Astronomy

Hans Ulrich Käufl[1] **& Alan Moorwood**[1]

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E-mail contact: ekstasy@eso.org

This workshop, which appears to be of particular interest to the *AGB Newsletter Commmunity*, will be hosted by the European Southern Observatory at its headquarters in Garching b. München, Germany

workshop date: Nov 18-21, 2003

Web site: `http://www.eso.org/gen-fac/meetings/ekstasy2003`

Background and aims:

Infrared spectroscopy at a resolution of a few km/s offers a unique tool to study rotational-vibrational transitions of many abundant molecules as well as important atomic lines in a multitude of interesting astrophysical environments. Applications beyond late-type stars, AGB stars and post-AGB-Objects include the possible direct detection of exoplanets, measurements of the abundances and magnetic fields of stars, studies of ISM chemistry and the kinematics of stars and gas in galactic centers.

The ESO VLT will shortly be equipped with two unique spectrometers which not only offer this high spectral resolution but also spatial resolutions of ≈ 0.2arcsec:

- CRIRES, an adaptive optics fed $1-5\mu m$ spectrograph with $\lambda/\Delta\lambda \approx 10^5$
- VISIR, including a mode with $\lambda/\Delta\lambda \leq 3 * 10^4$ 30.000 between $8-13\mu m$

The aims of this workshop are to:

- present the latest status of the high-resolution infrared spectroscopic capabilities of the VLT and other observatories
- provide an opportunity to present recent results
- bring together the community interested in the application of high resolution infrared spectroscopy and to foster new collaborations
- provide ESO with feedback in the phase when operating and data reduction software is being defined and coded

Registration: **absolute deadline** via the Web page is August 30th 2003, but please note that earlier registration is advised as the number of participants is limited to 110 for space reasons.

Scientific Advisory Committee: Bengt Gustafsson (Uppsala, chair), Catherine de Bergh (Meudon), Ewine van Dishoeck (Leiden), Artie Hatzes (Tautenburg), Ken Hinkle (Tucson), Ulli Käufl (ESO), Alan Moorwood (ESO,co-chair)

for all other details please consult the webpage:
`http://www.eso.org/gen-fac/meetings/ekstasy2003`

On behalf of the SOC
hope to see you in Garching
Ulli Käufl