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Accepted Papers

A first study of the colliding wind WR + O binary WR 30a

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We present a detailed, extensive investigation of the photometric and spectroscopic behaviour of WR 30a. This star is definitely a binary system with a period around 4.6 days. We propose the value $P = 4.619$ d ($\sigma = 0.002$ d). The identification of the components as WO4 + O5((f)) indicates a massive evolved binary system; the O5 component is a main sequence or, more likely, a giant star. The radial velocities of the O star yield a circular orbit with an amplitude $K_{\rm O} = 29.9$ ($\sigma = 2.1$) km s^{-1} and a mass function of 0.013 ($\sigma = 0.003$) $M_\odot$. The spectrum of WR 30a exhibits strong profile variations of the broad emission lines that are phase-locked with the orbital period. We report the detection of the orbital motion of the WO component with $K_{\rm WO} = 189$ km s^{-1}, but this should be confirmed by further observations. If correct, it implies a mass ratio $\frac{M_{\rm WO}}{M_{\rm O}} = 0.16$. The star exhibits sinusoidal light variations of amplitude 0.024 mag peak to peak with the minimum of light occurring slightly after the conjunction with the O star in front. On the basis of the phase-locked profile variations of the

C IV λ4658 blend in the spectrum of the WO, we conclude that a wind-wind collision phenomenon is present in the system. We discuss some possibilities for the geometry of the interaction region.

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HST Imagery and CFHT Fabry-Perot 2-D Spectroscopy in Hα of the Ejected Nebula M1-67: Turbulent Status

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Bright circumstellar nebulae around massive stars are potentially useful to derive time-dependent mass-loss rates and hence constrain the evolution of the central stars. A key case in this context is the relatively young ejection-type nebula M1-67 around the runaway Population I Wolf-Rayet star WR124 (= 209 BAC), which exhibits a WN8 spectrum. With HST-WFPC2 we have obtained a deep, Hα image of M1-67. This image shows a wealth of complex detail which was briefly presented previously by Grosdidier *et al.* (1998). With the interferometer of the Université Laval (Québec, Canada), we have obtained complementary Fabry-Perot Hα data using CFHT MOS/SIS.

¿From these data M1-67 appears more-or-less as a spherical (or elliptical, with the major axis along the line of sight), *thick, shell* seen almost exactly along its direction of rapid spatial motion away from the observer in the ISM. However, a simple thick shell by itself would not explain the observed multiple radial velocities along the line of sight. This velocity dispersion leads one to consider M1-67 as a thick *accelerating* shell. Given the extreme perturbations of the velocity field in M1-67, it is virtually impossible to measure any systematic impact of the present WR (or previous LBV) wind on the nebular structure. The irregular nature of the velocity field is likely due to either large variations in the density distribution of the ambient ISM, or large variations in the central star mass-loss history. In addition, either from the density field or the velocity field, we find no clear evidence for a bipolar outflow, as was claimed in other studies.

On the deep Hα image we have performed continuous wavelet transforms to isolate stochastic structures of different characteristic size and look for scaling laws. Small-scale wavelet coefficients show that the density field of M1-67 is remarkably structured in chaotically (or possibly radially) oriented *filaments* everywhere in the nebula. We draw attention to a short, marginally inertial range at the smallest scales (6.7–15.0 $\times 10^{-3}$ pc), which can be attributed to turbulence in the nebula, and a strong scale break at larger scales. Examination of the structure functions for different orders shows that the turbulent regime may be intermittent.

Using our Fabry-Perot interferograms, we also present an investigation of the statistical properties of fluctuating gas motions using structure functions traced by Hα emission-line centroid velocities. We find that there is a clear correlation at scales 0.02–0.22 pc between the mean quadratic differences of radial velocities and distance over the surface of the nebula. This implies that the velocity field shows an inertial range likely related to turbulence, though not coincident with the small inertial range detected from the density field. The first and second order moments of the velocity increments are

found to scale as $\langle|\Delta v(r)|\rangle \sim r^{0.5}$ and $\langle|\Delta v(r)|^2\rangle \sim r^{0.9}$. The former scaling law strongly suggests that supersonic, compressible turbulence is at play in the nebula, on the other hand, the latter scaling law agrees very well with Larson-type laws for velocity turbulence. Examination of the structure functions for different orders shows that the turbulent regime is slightly intermittent and highly multifractal with universal multifractal indexes $\alpha \approx 1.90$–1.92 and $C_1 \approx 0.04 \pm 0.01$.

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Multi-frequency variations of the Wolf-Rayet system HD 193793 (WC7pd+O4-5). III. *IUE* observations

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The colliding-wind binary system WR 140 (HD 193793, WC7pd+O4-5, $P = 7.94$ yr) was monitored in the ultraviolet by *IUE* from 1979 to 1994 in 35 short-wavelength high-resolution spectra. An absorption-line radial-velocity solution is obtained from the photospheric lines of the O component, by comparison with a single O star. The resulting orbital parameters, $e = 0.87 \pm 0.05$, $\omega = 31° \pm 9°$ and $K_{\rm O\,star} = 25 \pm 15\,{\rm km\,s^{-1}}$, confirm the large eccentricity of the orbit, within the uncertainties of previous optical studies. This brings the weighted mean UV-optical eccentricity to $e = 0.85 \pm 0.04$. Occultation of the O-star light by the WC wind and the WC+O colliding-wind region results into orbital modulation of the P-Cygni profiles of the C II, C IV and Si IV resonance lines. Near periastron passage, the absorption troughs of those resonance-line profiles increase abruptly in strength and width, followed by a gradual decrease. In particular, near periastron the *blue* black-edges of the P-Cygni absorption troughs shift to larger outflow velocities. We discuss that the apparently larger wind velocity and velocity dispersion observed at periastron could be explained by four phenomena: (*i*) geometrical resonance-line eclipse effects being the main cause of the observed UV spectral variability, enhanced by sightline crossing of the turbulent wind-wind collision zone; (*ii*) the possibility of an orbital-plane enhanced WC7 stellar wind; (*iii*) possible common-envelope acceleration by the combined WC and O stellar radiation fields; and (*iv*) possible enhanced radiatively driven mass loss due to tidal stresses, focused along the orbiting line of centers.

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Line ratios for Helium-like ions: Applications to collision-dominated plasmas

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The line ratios R and G of the three main lines of He-like ions (triplet: *resonance*, *intercombination*, *forbidden* lines) are calculated for C V, N VI, O VII, Ne IX, Mg XI, and Si XIII. These ratios can be used to derive electron density $n_{\rm e}$ and temperature $T_{\rm e}$ of hot late-type stellar coronae and O, B stars from high-resolution spectra obtained with *Chandra (LETGS, HETGS)* and *XMM-Newton (RGS)*. All excitation and radiative processes between the levels and the effect of upper-level cascades from collisional electronic excitation and from dielectronic and radiative recombination have been considered. When possible the best experimental values for radiative transition probabilities are used. For the higher-Z ions (i.e. Ne IX, Mg XI, Si XIII) possible contributions from blended dielectronic satellite lines to each line of the triplets were included in the calculations of the line ratios R and G for four specific spectral resolutions: *RGS*, *LETGS*, *HETGS-MEG*, *HETGS-HEG*. The influence of an external stellar radiation field on the coupling of the 2^3S (upper level of the *forbidden* line) and 2^3P levels (upper levels of the *intercombination* lines) is taken into account. This process is mainly important for the lower-Z ions (i.e. C V, N VI, O VII) at moderate radiation temperature ($T_{\rm rad}$). These improved calculations were done for plasmas in collisional ionization equilibrium, but will be later extended to photo-ionized plasmas and to transient ionization plasmas. The values for R and G are given in extensive tables, for a large range of parameters, which could be used directly to compare to the observations.

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Chandra Detection of a Close X-ray Companion and Rich Emission Line Spectrum in the Wolf-Rayet Binary γ Velorum

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We present first results of a high-resolution X-ray observation of the nearby Wolf-Rayet binary system γ^2 Velorum (WC8 + O7.5) using the *Chandra* High Energy Transmission Grating (HETG). Emission lines from Mg, Si, S, Ne, and Fe dominate the spectrum and imply a range of plasma temperatures from $\sim$4 MK up to at least $\sim$25 MK. The strongest lines are broadened but no Doppler shifts are detected. He-like triplets show strong forbidden lines with no significant weakening from collisional effects or photoexcitation, contrasting sharply with the diluted forbidden lines of single O-type supergiants such

as ζ Puppis. These results imply that some lines such as the Ne IX triplet are formed in cooler plasma at tens of stellar radii or more from the O star, well outside of the central wind interaction region located near the O star surface. Lastly, we report the discovery of a new X-ray source lying only $4.''8$ north of γ^2 Vel that is very likely a low mass *pre-main-sequence* star.

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Ultraviolet Spectrophotometry of Variable Early-Type Be and B Stars Derived from High-Resolution IUE Data

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High-dispersion *IUE* data encode significant information about aggregate line absorptions that cannot be conveniently extracted from individual stellar spectra. Herein we apply a new technique in which fluxes from each echelle order of a short-wavelength *IUE* spectrum are binned together to construct low-resolution spectra of a rapidly varying B or Be star. The division of binned spectra obtained during a "bright-star" phase by spectra from a "faint-star" phase leads to a ratioed spectrum which contains information about the mechanism responsible for a star's variability. The most likely candidate mechanisms are either the periodic or episodic occultations of the star by ejected matter or a change in photospheric structure, e.g. from pulsation. We model the variations caused by these mechanism by means of model atmosphere and absorbing-slab codes. Line absorptions strength changes are rather sensitive to physical conditions in circumstellar shells and "clouds" at temperatures of 8,000–13,000 K, which is the regime expected for circumstellar structures of early B stars.

To demonstrate proofs of concept, we constructed spectral ratios for circumstellar structures associated with flux variability in various Be stars: (1) Vela X-1 has a bow-shock wind trailing its neutron star companion; at successive phases and hence in different sectors, the wind exhibits spectrophotometric signatures of a 13,000 K or 26,000 K medium, (2) 88 Her undergoes episodic "outbursts" during which its UV flux fades, followed a year later by a dimming at visible wavelengths as well; the ratioed spectrum indicates the "phase lag" is a result of a nearly gray opacity that dominates all wavelengths as the shell expands from the star and cools, permitting the absorptions in the visible to "catch up" to those in the UV, and (3) ζ Tau and 60 Cyg exhibit periodic spectrum and flux changes, which match model absorptions for occulting clouds but are actually most easily seen from selective variations of various resonance lines. In addition, ratioed UV spectra of radial and large-amplitude nonradial pulsating stars show unique spectrophotometric signatures which can be simulated with model atmospheres. An analysis of ratioed spectra obtained for a representative sample of 18 classical Be stars known to have rapid periodic flux variations indicates that 13 of them have ratioed spectra which are relatively featureless or have signatures of pulsation. Ratioed spectra of three others in the sample exhibit signatures that are consistent with the presence of co-rotating clouds.

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Cyclicities in the light variations of S Doradus stars

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On the basis of new photometric observations and archived data published since 1907, we discuss the light variations of P Cygni. We conclude that there is a stable (pulsation) period of ~ 17.3 days with an additional long cycle of variation of $P \sim 1500 - 1600$d and amplitude $0\overset{\mathrm{m}}{.}02$.

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The Orbit of the Massive X-ray Binary LS 5039

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We present the first spectroscopic orbit for the massive X-ray binary LS 5039 which we find to be a short period ($P = 4.117 \pm 0.011$ d) and highly eccentric ($e = 0.41 \pm 0.05$) system. The low mass function for the orbit appears to be most consistent with a neutron star companion, although a black hole remains a possibility if the system has a low inclination. The spectrum of the O7 V optical star appears to be normal for its type (suggesting that there is little flux in the red from an accretion disk) except that the C 4 $\lambda\lambda 5801, 5812$ lines are very weak, perhaps indicating the presence of CNO-processed gas in the O-star. There is no evidence of Hα emission, so the system is probably not currently undergoing Roche lobe overflow. The projected rotational velocity, $V \sin i = 131 \pm 6$ km s^{-1}, suggests that the optical star is rotating faster than synchronously with the orbit. The peculiar component of the systemic radial velocity is -17 ± 3 km s^{-1} so the system is not a runaway star (at least not in this dimension).

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Confidence limits of evolutionary synthesis models III. On time-integrated quantities

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Evolutionary synthesis models are a fundamental tool to interpret the properties of observed stellar systems. In order to achieve a meaningful comparison between models and real data, it is necessary to calibrate the models themselves, i.e. to evaluate the dispersion due to the discreteness of star formation as well as the possible model errors. In this paper we show that linear interpolations in the $\log M - \log t_k$ plane, that are customary in the evaluation of isochrones in evolutionary synthesis codes, produce unphysical results. We also show that some of the methods used in the calculation of time-integrated quantities (kinetic energy, and total ejected masses of different elements) may produce unrealistic results. We propose alternative solutions to solve both problems. Moreover, we have quantified the expected dispersion of these quantities due to stochastic effects in stellar populations. As a particular result, we show that the dispersion in the $^{14}N/^{12}C$ ratio increases with time.

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Submitted Papers

Profile Shapes for Optically Thick X-ray Emission Lines from Stellar Winds

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We consider the consequence of optical depth effects for the profile shape of X-ray emission lines formed in stellar winds. The hot gas is thought to arise in distributed wind shocks, and the line formation is predominantly via collisional excitation followed by radiative decay. Such lines are often modelled as optically thin, but the theory has difficulty matching observed resolved X-ray line profiles. We suggest that for strong lines of abundant metals, newly created photons may undergo resonance scattering in the same line, modifying the emergent profile. Using standard Sobolev theory in a spherically symmetric wind, we show that thick-line resonance scattering leads to emission profiles that still have blueshifted centroids like the thin lines, but which are considerably less asymmetric in appearance. We focus on winds in the constant-expansion phase, and derive an analytic form for the profile shape in the limit of large line and photoabsorptive optical depths. In this limit the emission profile reduces to a universal shape and has a centroid shift of $-0.24v_\infty$ with a HWHM of $0.63v_\infty$. Using published data for *Chandra* observations of five emission lines from the O star ζ Pup, we find that the observed HWHMs are somewhat smaller than predicted by our theory; however, the centroid shifts of all five lines are consistent with our theoretical result. We also consider the augmentation of the re-absorption that occurs as line photons traverse long pathlengths when they multiply scatter within an optically thick line before escaping the resonance zone. Even for lines with optical depths of only a few, re-absorption effects can further reduce both the line equivalent width and its overall asymmetry. Such

effects may help in explaining sub-solar metallicities observed in O star X-ray spectra by *ASCA* and nearly symmetric emission lines observed in ζ Ori and θ^1 Ori C by *Chandra*.

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Tomographic Separation of Composite Spectra. VIII. The Physical Properties of the Massive Compact Binary in the Triple Star System HD 36486 (δ Orionis A)

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We present the first double-lined spectroscopic orbital elements for the central binary in the massive triple, δ Orionis A. The solutions are based on fits of cross-correlation functions of *IUE* high dispersion UV spectra and He 1 λ6678 profiles. The orbital elements for the primary agree well with previous results, and in particular, we confirm the apsidal advance with a period of 224.5±4.5 y. We also present tomographic reconstructions of the primary and secondary stars' spectra that confirm the O9.5 II classification of the primary and indicate a B0.5 III type for the secondary. The relative line strengths between the reconstructed spectra suggest magnitude differences of $\Delta m = -2.5 \log(F_s/F_p) = 2.6 \pm 0.2$ in the UV and $\Delta m = 2.5 \pm 0.3$ at 6678 Å. The widths of the UV cross-correlation functions are used to estimate the projected rotational velocities, $V \sin i = 157 \pm 6$ km s^{-1} and 138 ± 16 km s^{-1} for the primary and secondary, respectively (which implies that the secondary rotates faster than the orbital motion).

We used the spectroscopic results to make a constrained fit of the *Hipparcos* light curve of this eclipsing binary, and the model fits limit the inclination to the range $i = 67° - 77°$. The lower limit corresponds to a near Roche-filling configuration that has an absolute magnitude which is consistent with the photometrically determined distance to Ori OB1b, the Orion Belt cluster in which δ Ori resides. The $i = 67°$ solution results in masses of $M_p = 11.2\ M_\odot$ and $M_s = 5.6\ M_\odot$, both of which are substantially below the expected masses for stars of their luminosity. We suggest that the primary of δ Ori A has suffered extensive mass loss through a binary interaction (perhaps during a common envelope phase) in which most of the mass was lost from the system rather than transferred to the secondary.

We also made three component reconstructions to search for the presumed stationary spectrum of the close visual companion, δ Ori Ab (Hei 42 Ab). There is no indication of the spectral lines of this tertiary in the UV spectrum, but a broad and shallow feature is apparent in the reconstruction of He 1 λ6678 indicative of an early B-type star. The tertiary may be a rapid rotator ($V \sin i \approx 300$ km s^{-1}) or a spectroscopic binary.

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Proceedings

Stellar metallicities beyond the Local Group

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Luminous BA-type supergiants are the visually brightest stars in spiral and irregular galaxies. Substantial progress in their theoretical modelling has been achieved by the application of sophisticated non-LTE spectrum synthesis. After testing of the method on Local Group objects at high resolution, the next step has been taken. First results from medium-resolution spectroscopy of supergiants in NGC 3621 at a distance of 6.7 Mpc, obtained with the FORS instrument on the VLT, are presented. Fundamental parameters of individual stars are determined at such distances for the first time. This allows the reduction of systematic errors of the Cepheid distance scale by providing information on the metallicity, colour excess and extinction of objects adjacent to Cepheids. Moreover, the supergiants themselves will act as an independent distance indicator through the application of the wind momentum–luminosity relationship after a proper empirical calibration.

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What are the Sources of X-rays from Hot Stars? Comparing Two Prototypes

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Since the earliest X-ray observations, ζ Pup and δ Ori have been used as prototypes for understanding the physical origins of hot-star X-rays. When observed at the resolution of Chandra's HETG, these two stars' spectra are surprisingly different: While ζ Pup shows the broad, blue-shifted line profiles expected from shocks distributed throughout the wind, δ Ori's line profiles are surprisingly narrow and symmetric. X-ray emission from the colliding winds of the close binary in δ Ori may explain some of this discrepancy.

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Chandra Observations of O Stars

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We discuss the Chandra HETG observations of four O-stars. Several H- and He-like ion emission lines are observed indicating a range in temperature of $\sim$ 2 to 16 MK. All of the lines are very broad showing a range in HWHM of 300 - 1600 km s^{-}1. In the case of early-type stars the relative strengths of the He-like fir lines (S XV, Si XIII, Mg XI, Ne IX, and O VII) are sensitive to the photospheric UV radiation from the star. As a result we can use the ratio of line strengths to derive the distance of the X-ray line emission source from the star. Combining this location information with continuum optical depth constraints shows that the He-like ions are distributed throughout the wind from very near the star to at least 20 stellar radii. The fact that the line radiation of the high ions, S XV and Si XIII, originates close to the star is contrary to the predictions of standard wind shock models. Another surprise is that, with the exception of ζ Pup, the centroids of the lines are not blue-ward shifted. Such a shift would be expected since line radiation from the near side of the star should be less attenuated by continuum opacity than that from the back side.

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News

P CYGNI 2000: 400 Years of Progress

Edited by Mart de Groot[1] and Christiaan Sterken[2]

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The Proceedings of this Workshop held in August 2000 will come off the press in late September. Those who were unable to attend the Workshop but would like to receive a copy of the Proceedings can obtain one by sending a message to Mart de Groot (mdg@star.arm.ac.uk). Copies will cost USD 50.00 which includes P&P. Further information is available on the Workshop web site at http://star.arm.ac.uk/$\sim$mdg

Jobs

Postdoctoral Positions

Instituto de Astronomia, Universidad Nacional Autonoma de Mexico

The Instituto de Astronomía-UNAM, Mexico, expects to have two openings for postdoctoral fellows beginning in October 2001. The positions are for one year with the possibility of renewal for a second year, and with residence in either Mexico City (one position) or Morelia, Michoacán (one

position). The Institute has an active staff involved in most branches of astrophysical research. Research programmes include theory, observations, and instrumentation development. The Instituto de Astronomía, has a network of workstations and provides the following research facilities:

– The Observatorio Astronómico Nacional at San Pedro Mártir, Baja California and at Tonantzintla, Puebla with telescopes of 2.1m, 1.5m, 0.84m and 1m.

– Access to the UNAM's Supercomputers (CRAY and Origin 2000).

Positions are open for recent Ph.D.'s in Physics and Astronomy, independent of nationality. Candidates interested in collaborating with staff members in the fields of **Interstellar Medium**, **Star Formation** or **Stellar Atmospheres** are encouraged to apply. Outstanding candidates in related fields will also be considered. Applicants should include a curriculum vitae, with a list of publications, two letters of recommendation, and a statement of their research interests and goals. The deadline for applications is the **30th of August 2001**.

Please direct inquiries and send all documents to: **José Franco** or **Gloria Koenigsberger**, Instituto de Astronomía, UNAM, Apartado Postal 70-264, 04510, México, D.F., or to their e-mail addresses

pepe@astroscu.unam.mx, **gloria@astroscu.unam.mx**.

Meetings

JENAM 2001 Minisymposium on Massive Stars, the ISM, and Chemical Evolution

Munich, 10-15 Sep 2001

It is our aim to discuss the physics of massive stars and their interaction with their environments, on concurrent time scale, and on longer time scales extending to evolution of massive-star clusters and the chemical evolution of the ISM and entire galaxies.

We would like to remind you that abstracts for your contributions were due 13 July 2001.

Please email your abstract to rod@mpe.mpg.de We thank you in advance for your contributions! This should be an interesting session, following up on the 1999 Meeting in Toulouse.

With best regards,

Roland Diehl (MS2 convener)

PS: Information on JENAM 2001 (10-15 Sep 2001 in Munich/D) can be found at
http://www.mpa-garching.mpg.de/english/conferences/jenam01/
and on the Minisymposium No 2 at
http://www.gamma.mpe-garching.mpg.de/mpeteam/workshop/jenam01_MSISM.htm

IAU SYMPOSIUM No. 212
A Massive Star Odyssey, from Main Sequence to Supernova

Lanzarote, Canary Islands, Spain, 24–28 June 2002

SOC co-chairs:
Karel A. van der Hucht (k.a.van.der.hucht@sron.nl)
Artemio Herrero (ahd@ll.iac.es)

LOC chair:
César Esteban (cel@ll.iac.es)

The First Announcement will be issued in September 2001.

CNO in the Universe

Saint-Luc (Valais, Switzerland), 10–14 September 2002

Aim of the conference
Carbon, nitrogen and oxygen share a special rank among the chemical elements. Oxygen represents about half of the mass fraction of the heavy elements in the solar neighbourhood. Produced by massive stars, the evolution of its abundance as a function of time is related to the star formation activity. Carbon, which is an essential ingredient of the building blocks of life, is produced by both massive and intermediate mass stars in proportions which still remain to be determined. Nitrogen, long considered to be a purely secondary element essentially produced by intermediate mass stars has likely a more complicated nucleosynthesis history, where massive and AGB stars may also play a role.

Since the ESO Workshop entitled "Production and Distribution of C, N, O elements" held at Garching in May 1985, no dedicated Workshop on this subject has been organised. In the last fifteen years many observational and theoretical results have modified our view on CNO abundances in the universe. The opening of new observational facilities as the VLT and the HST has pushed away the horizon for detailed abundance determinations, providing unique probes of high–redshift star formation and galaxy evolution. There is now growing evidence that many QSO environments have roughly solar or higher metallicities out to redshifts ¿4. Observations of DLA systems provide direct measurements on the chemical enrichment history of neutral gas in the early universe.

Of course the question is how to interpret these observations, what do they tell us on the nature of the galaxies in the young universe, on their star formation activity. A prerequisite to interpret the observations of CNO abundances in high redshift regions is the confrontation of the theoretical predictions with well observed feature in our nearby universe. In that respect, the observed CNO abundances at the surface of stars in different galaxies of the Local Group represent strong constrains on the way stellar evolution proceeds in different environments. In the same way, their abundance gradients in galaxies are cornerstones for galactic chemical evolution models.

The aim of this conference is to attempt a synthesis between these different domains of research. We hope that this will help making the CNO elements a still powerful diagnostic tool for investigating the connections between stellar, galactic and cosmic evolution.

The meeting is also be held in the honour of the 60th birthday of Prof. Andre Maeder, who has so much contributed to our understanding of stellar evolution and nucleosynthesis.

Location/date/duration
The conference will be held in Saint-Luc, a small resort in the Swiss Alps (see the Web page: http://www.anniviers.ch/stluc/), from 10 to 14 September 2002.

The conference will take place from Tuesday morning (arrival of the participants monday night) to Saturday (noon) including half a day off (for hiking etc). This amounts to 4 days for the sessions.

Participants
We expect 60 to 80 participants. St Luc is a small resort and we could not go far above this limit.

PRELIMINARY PROGRAM

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 The conference will be organised in five sessions:

I. CNO in STARS
   The nuclear processes responsible for CNO synthesis
   CNO at the surface of MS stars: OB stars
   CNO in the post--MS phases of massive stars
   CNO at the surface of low and intermediate MS stars
   CNO in the post--MS phases of intermediate mass stars

II. CNO in the Local Group (including Milky Way)
   CNO in the Solar System and the local ISM
   CNO abundances in galactic HII regions and Planetary Nebuale
   CNO abundances in galactic molecular regions
   Stellar yields from massive stars
   Stellar yields from intermediate mass stars
   CNO galactic chemical evolution

III. CNO in extra--galactic systems (beyond the Local Group)
   CNO abundances in dwarf and spiral galaxies
   CNO abundances in the intergalactic medium

IV. CNO at high redshift
   CNO in Damped Lyman alpha systems and in the Lyman-alpha forest
   CNO in Quasars and radio galaxies

V. Recent advances and perspectives
   Hydrodynamics and nucleosynthesis
   New generation of atmosphere models
   Chemo dynamical evolution of galaxies
   Observational perspectives
   CNO and life
Concluding remarks and perspectives
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Registration and call for contributions

The above subjects will be addressed in invited review talks. The program is open for oral contributions (20-25 minutes). Room will also be reserved for posters. No special poster session is planned.

Registration opens 1 october 2001, on the conference Web-site:
http://obswww.unige.ch/cno
where more information will be posted.

Proceedings
We will publish proceedings of the conference. Possible publishers include ASP Conf. Series, Astro-

physics & Space Science, Spinger and others, which are being investigated.

SOC:
M. Arnould (B), C. Charbonnel (F, co-chair), S. D'Odorico (D), A. Herrero (E), F. Hamann (USA), Y. Izotov (Ukraine), G. Meynet (CH, co-chair), M. Pettini (UK), D. Schaerer (F, co-chair), M. Shetrone (USA), M. Tosi (I), K. Venn (USA)

LOC:
M. Grenon (CH), G. Meynet (CH), F. Pont (CH), D. Schaerer (F)

IAU SYMPOSIUM No. 215
Stellar Rotation

Cancun, Mexico, 4-8 November 2002

SOC co-chairs:
André Maeder (andre.maeder@obs.unige.ch)
Philippe Eenens (eenens@astro.ugto.mx)

Web Site:
http://www.astro.ugto.mx/∼eenens/iau215/
Information will be posted in September