
THE AGB NEWSLETTER

*An electronic publication dedicated to stellar evolution
on the asymptotic giant branch and beyond*

No. 36 — 01 April 1997

Editors: Thierry Forveille and Claudine Kahane (agbnews@obs.ujf-grenoble.fr)

From the editors

Be careful, on the first of april, the habit is to make jokes, at least in most european countries.

Please note that the internet address of the computer on which we prepare the AGB newsletter has changed, from gag.observ-gr.fr to obs.ujf-grenoble.fr.

Abstracts of recently accepted papers

The spectral evolution of post-AGB stars

P.A.M. van Hoof¹, R.D. Oudmaijer^{2,1} and L.B.F.M. Waters^{3,4}

¹ Kapteyn Astronomical Institute, P.O. Box 800, 9700 AV Groningen, The Netherlands

² Imperial College, Blackett Laboratory, c/o Astronomy Group, Dept. of Physics, London SW7 2BZ, United Kingdom

³ Astronomical Institute “Anton Pannekoek”, University of Amsterdam, Kruislaan 403, 1098 SJ Amsterdam, The Netherlands

⁴ SRON Laboratory for Space Research, P.O. Box 800, 9700 AV Groningen, The Netherlands

A parameter study of the spectral evolution of a typical post-AGB star, with particular emphasis on the evolution of the infrared colours, is presented. The models are based on the latest evolutionary tracks for hydrogen burning post-AGB stars. For such tracks the evolutionary rate is very dependent on the assumed mass loss rate as a function of time. We investigate this effect by modifying the mass loss prescription. The newly calculated evolutionary rates and density distributions are used to model the spectral evolution of a post-AGB star with the photo-ionization code Cloudy, including dust in the radiative transfer. Different assumptions for the dust properties and dust formation are considered. It is shown that by varying these parameters in a reasonable way, entirely different paths are followed in the IRAS colour-colour diagram. First of all, the effects of the evolution of the central star on the expanding dust shell can not be neglected. Also the dust properties and the definition of the end of the AGB phase have an important effect. The model tracks show that objects occupying the same location in the IRAS colour-colour diagram can have a different evolutionary past, and therefore the position in the IRAS colour-colour diagram alone can not a priori give a unique determination of the evolutionary status of an object. An alternative colour-colour diagram, the K-[12] vs. [12]-[25] diagram, is presented. The tracks in this diagram seem less affected by particulars of the grain emission. This diagram may be a valuable additional tool for studying post-AGB evolution.

Accepted by MNRAS

*Preprints can be obtained by contacting p.van.hoof@astro.rug.nl
or via anonymous ftp on ftp://kapteyn.astro.rug.nl/preprints/226.ps.gz*

Stellar evolution of low and intermediate-mass stars: III. An Application of evolutionary post-AGB models: The variable central star FG Sagittae

T. Bloeker^{1,2} and D. Schönberner²

¹ Institut für Astronomie & Astrophysik, Universität Kiel, D-24098 Kiel, Germany

² Astrophysikalisches Institut Potsdam, Telegrafenberg, D-14473 Potsdam, Germany

Based on a set of evolutionary calculations for thermally pulsating post-AGB models we introduce a robust method to measure FG Sge's mass which was found to be $0.61M_{\odot}$. The corresponding evolutionary timescale is consistent with the expansion age of the planetary nebula. Assuming that FG Sge's surface was already enriched with heavy elements on the AGB we propose that during the central-star evolution these elements were removed from the superficial radiative layers due to, e.g., dust/gas separation, leaving the deeper convective layers unchanged. During the flash the outward moving envelope convection mixed the stored heavy elements back to the surface.

Accepted by Astronomy & Astrophysics.

Preprints can be obtained by contacting bloecker@astrophysik.uni-kiel.de,
or via anonymous ftp on 134.245.66.1 in /pub/tbloecker/fgsge/fgsge.ps.Z

Neutral atomic carbon in the globules of the Helix

K. Young¹, P. Cox^{2,3}, P.J. Huggins⁴, T. Forveille⁵, R. Bachiller⁶

¹ Smithsonian Astrophysical Observatory, 60 Garden Street MS 78, Cambridge, MA 02138

² Institut d'Astrophysique Spatiale, Université de Paris XI, 91405 Orsay, France

³ Institut d'Astrophysique de Paris, 92 bis, Boulevard Arago, 75014 Paris, France

⁴ Physics Department, New York University, 4 Washington Place, New York, NY 10003

⁵ Observatoire de Grenoble, B.P. 53X, 38041 Grenoble Cedex, France

⁶ IGN Observatorio Astronomico Nacional, Apt 1143, 28800 Alcalá de Henares, Spain

We report detection of the $609 \mu\text{m } ^3\text{P}_1 \rightarrow ^3\text{P}_0$ line of neutral atomic carbon in globules of the Helix nebula. The measurements were made towards the position of peak CO emission. At the same position, we obtained high-quality CO(2-1) and $^{13}\text{CO}(2-1)$ spectra and a $135\text{arcsec} \times 135\text{arcsec}$ map in CO(2-1). The velocity distribution of CI shows six narrow ($1-2 \text{ km s}^{-1}$) components which are associated with individual globules traced in CO. The CI column densities are $0.5-1.2 \times 10^{16} \text{ cm}^{-2}$. CI is found to be a factor of ~ 6 more abundant than CO. The large abundance of CI in the Helix can be understood as a result of the gradual photoionisation of the molecular envelope by the central star's radiation field.

Accepted by ApJ (Letters)

Preprints can be obtained by contacting rtm@dolson.harvard.edu

Superwind models for the dust shells around infrared carbon stars

Kyung-Won Suh¹

¹ Department of Astronomy and Space Science, Chungbuk National University, Cheongju-City, 361-763, Republic of Korea

We investigate the observational effect of a superwind mass loss phase driven by a thermal pulse in the interior of infrared carbon stars. We modify the dust density distribution by adding dust to form a region of enhanced

density which proceeds outward. Depending on the position and the degree of the enhancement, the emergent model spectral energy distributions can be significantly different from those with conventional power law density distributions. These new results fit the observations of some infrared carbon stars better. In particular, the deficiency in 30 - 100 μm observed fluxes of many infrared carbon stars, compared with conventional model results, can be explained by the superwind models with standard dust grains. Our superwind models also cover a much wider range in observed *IRAS* 12, 25 and 60 μm colours than is possible with conventional models. The time evolution of the spectral energy distribution after a superwind can explain some observations of infrared carbon stars. We find that most of the observed infrared carbon stars are in the early history of our superwind model. This may be due to a gradual increase in the mass loss rate on the AGB or the selection effect of infrared carbon stars identified by the 11 μm SiC feature.

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

Preprints can be obtained by contacting kwsuh@cbucc.chungbuk.ac.kr

or via WWW on <http://astro.chungbuk.ac.kr/kwsuh/kwsuh.htm>

A stellar endgame – the born-again Sakurai’s object

M. Asplund¹, B. Gustafsson¹, D.L. Lambert², and N. Kameswara Rao³

¹ Astronomiska observatoriet, Box 515, S-751 20 Uppsala, Sweden

² Department of Astronomy, University of Texas, Austin, TX 78712, USA

³ Indian Institute of Astrophysics, Bangalore 560 034, India

The surface chemical composition of this remarkable star shows that it is hydrogen-deficient, carbon-rich and enriched in the light *s*-process elements. Spectra taken in May and October 1996 indicate a decrease in the surface hydrogen abundance by 0.7 dex in five months along with an increase in the abundances of Li, Sr, Y and Zr. The abundance changes are in agreement with the hypothesis of the star being a rapidly evolving “born-again” AGB star experiencing a final He-shell flash, similar to FG Sge. The ¹²C/¹³C ratio in October is very low, also suggesting hydrogen ingestion. By chemical composition, Sakurai’s object resembles the R Coronae Borealis (R CrB) stars.

Accepted by Astronomy & Astrophysics (Letters to the Editors)

Preprints can be obtained by contacting martin@astro.uu.se

or via WWW on <http://www.astro.uu.se/martin>

or via anonymous ftp on <ftp://ftp.astro.uu.se/pub/articles/atmos/P112/>

The nature of the silicon carbide in carbon star outflows

A. K. Speck¹, M. J. Barlow¹ and C. J. Skinner²

¹ Department of Physics and Astronomy, University College London, Gower Street, London WC1E 6BT.

² Space Telescope Science Institute, 3700 San Martin Drive, Baltimore, MD 21218, USA.

We present 7.5–13.5 μm UKIRT CGS3 spectra of 32 definite or candidate carbon stars. In addition to the extreme carbon star AFGL 3068, the only C-star previously known to show the 11- μm silicon carbide (SiC) feature in absorption, we have discovered three further examples of sources that show SiC in net absorption, namely IRAS 02408+5458, AFGL 2477 and AFGL 5625. We have investigated the mineralogy of carbon star silicon carbide and its relationship to meteoritic dust by using a χ^2 -minimisation routine to fit the observed SiC features, using laboratory optical constants that have been published for a variety of SiC samples. With the exception of R For all of the observed SiC features are best fitted by α -SiC grains. Excluding V414 Per all of the sources with 8–13 μm colour temperatures $> 1200\text{K}$ (corresponding to mass loss rates at the bottom

end of the range) are best fitted by α -SiC in pure emission, whereas all but one of the sources with 8–13 μm colour temperatures $< 1200\text{K}$ (corresponding to higher mass loss rates) are best fitted using self-absorbed α -SiC emission. The four sources whose SiC features are in net absorption (and which have the lowest 8–13 μm colour temperatures and therefore presumably the highest mass loss rates) are also well fitted by self-absorbed α -SiC emission, but with higher optical depths. Given that β -SiC is the form most commonly found in meteorites, we have searched for evidence of β -SiC in the circumstellar shells of all these carbon stars. However, our observations provide no unambiguous evidence for the presence of β -SiC around these stars, with all of the observed SiC features being best explained in terms of α -SiC grains. The self absorption that we find in the observed SiC emission features has not previously been taken into account in radiative transfer modelling and so the amount of SiC present in the outflows has probably been underestimated in the past.

Accepted by MNRAS.

Preprints can be obtained by contacting aks@star.ucl.ac.uk

or via WWW on <http://www.star.ucl.ac.uk/aks>

or via anonymous ftp on <ftp://ftp.star.ucl.ac.uk/pub/aks/Paper1/Paper1a.html>

Messages

CALL FOR PAPERS 1st INTERNATIONAL WORKSHOP ON COMPUTATIONAL SEMIOTICS 26th - 27th May, 1997 Pôle Universitaire Léonard de Vinci PARIS - LA DEFENSE - FRANCE

TOPICS

SEMIOTICS OF TEXT : Suzanne Bertrand-Gastaldy, University of Montreal

Computers are increasingly used to assist text analysis for cognitive, literary, anthropological, sociological, documentary, etc. research. The workshop will focus on actual realisations, on the possibilities and limits of methodologies and existing tools to take into account the complex and multidimensional nature of texts, allowing multiple points of views for a variety of user needs. Issues such as desirable features of text analysis software, robustness and conviviality of implantations, interaction between corpora and users, constraints that actual tools put upon kinds of analyses and coding choices, the ability to elaborate models of electronic analytical tools suited to different semiotic theories, semiotical foundations of markup languages are examples of possible debates.

SEMIOMETHODOLOGY : Claude Vogel, Léonard de Vinci University

Several genres are currently under investigation for semiotic studies : electronic mail, news, corporate information, Web publishing. The flood of full text is overflowing semantic analysis, and this major paradigm break leads us to reconsider our approach of text processing. The size of these new corpora, the lack of consistency of information, the physical scattering of the basic units of texts, make the classical documentary solutions very uncomfortable. Instead, the semiotic based analysis seems to be a highly compelling perspective. It is focused on chronology; it provides a way to build transitive narratives throughout large amounts of data, and it does not require the understanding of the details of each local grammatical sentence in order for a global plot to be elaborated. This promising trend may give a second wind to ethnomethodology. For this reason, it is more appropriate to use the term "semiomethodology" when evoking this attempt to rationalize the computational approach of the symbolic dynamics which underlie collaborative production.

ORGANIZATIONAL SEMIOTICS : Kathleen Carley, Carnegie Mellon University

Organizational semiotics is the semiotics of organizations and organizational dimensions of textual semiotics. The objective of this workshop is to define the boundaries of this new specialty. Specifically, we will address

the issue of : "How can semiotic analysis of interpersonal and corporate exchanges be used to reveal, evaluate, and contrast the underlying organizational logics and changes in these logics over time ?" Recent advances in textual analysis are facilitating this endeavor and creating new opportunities for understanding organizational behavior. Critical issues in the area of organizational semiotics include : 1) how to quickly and reliably analyze large quantities of texts, 2) how to reduce textual data to an empirical form that can be combined with other types of data and analyzed statistically, 3) how to identify corporate texts (those representing the "view" of the organization as an entity) and address issues of authorship, and 4) how to identify institutional constraints on the production and maintenance of corporate texts. New and innovative computational methods for empirically analyzing texts are being developed to address these and related concerns. These techniques have the potential to move textual analysis beyond counting words or locating a few themes or concepts. This section will focus on the issues involved in performing organizational semiotics with particular attention to the new computationally based techniques for facilitating organizational analysis that increase the ease, speed or reliability of coding texts and generate information that can be analyzed statistically.

BIOSEMIOTICS : Jean-Claude Heudin, Léonard de Vinci University

Recently, algorithms and architectures based on models derived from biological systems have been receiving an increasing amount of interest. This section will explore how such new approaches and techniques could be used for managing large amount of information exchanges on Internet or Intranet. Topics of particular interest include, but are not limited to, applications of agent-based systems, autonomous and evolving agents, genetic algorithms and programming, neural networks, cellular automata etc. to text stream analysis and in the more general framework of semiotics analysis.

SUBMISSION OF PAPERS

Send four copies of an abstract (approximately 500 words) in english or email it to :

Irène Ludman - IWCS'97
Pôle Universitaire Léonard de Vinci
92916 PARIS-LA DEFENSE-CEDEX, FRANCE
Phone: (33) 01 41 16 73 05
Fax : (33) 01 41 16 73 35
Email : irene.ludmann@devinci.fr

DEADLINES

Submission of abstracts by 1st April 1997
Acceptance notification to authors by 15th April 1997
Submission of full papers by 12th May 1997

ORGANIZING COMMITTEE

Claude Vogel (chairman)
Suzanne Bertrand-Gastaldy
Kathleen Carley
Jean-Claude Heudin

PROGRAM COMMITTEE

Pierre Boudon (Canada)
Guillaume Deffuant (France)
Evelyne Lutton (France)
Joe Porac (USA)
Carl Roberts (USA)
J. Sebeok (Canada)
Peter Stockinger (France)
Bill Turner (France)

For more information please visit the following Web page : <http://www.devinci.fr/home/actua.htm>