ISSN 0296-3140

Be STAR NEWSLETTER

NUMBER 29 – December 1994

Editor-in-Chief:
Geraldine J. Peters
e-mail: peters@hyades.dnet.nasa.gov
Space Sciences Center
University of Southern California
University Park
Los Angeles, CA 90089-1341
Tel: (213) 740-6336
FAX: (213) 740-6342

Technical Editor:
Douglas R. Gies
e-mail: gies@chara.gsu.edu
Center for High Angular Resolution Astronomy
Georgia State University
University Plaza
Atlanta, Georgia, 30303-3083
Tel: (404) 651-2932
FAX (404) 651-1389

Contents

1. EDITORIAL

1.1. Editorial

Seasons Greetings! We are pleased to publish Issue 29 of the *Be Star Newsletter*. This is the second issue that is available in three versions: paper, ASCII text that can be obtained via anonymous ftp, and Mosaic display on the World Wide Web. Our first electronic version of the *Newsletter* appears to have been well received by the community, and we will continue to institute changes as more issues are produced. We want to hear more of your comments and, in particular, suggestions for improvement.

Issue No. 29 has turned out to be a rather large issue with a diversity of topics including both rapid and long-term spectroscopic variability, kinematics in circumstellar envelopes, and multiwavelength observations. The issue contains the usual sections, "Working Group Matters", "Contributions", "What's Happening?", "Preprints Received", "Bibliography", and "Meetings" of possible interest to the B star community. We would like to thank those who contributed to and helped compile the bibliography.

Since we anticipate publishing the next issue around early June, please send contributions for Issue No. 30 to the editor-in-chief and technical editor by:

May 1, 1995.

We recommend that communications be sent via Electronic Mail (SPAN/DECnet - HYADES::PETERS, Internet - peters@hyades.dnet.nasa.gov, gies@chara.gsu.edu). If it is not possible to transmit the contribution electronically, we request that it be submitted in a camera-ready condition (see papers in the current issue for style). Contributions may also be sent by FAX (telephone number: 213-740-6342 and 404-651-1389), but this is not recommended for papers that are longer than a half page or those that contain figures due to the degradation of the resolution. Dark, clear copies of all figures should be sent by regular mail. Illustrations may also be sent by e-mail as a Postscript file. We prefer that contributions and abstracts of submitted papers be sent electronically as TeX or LaTeX files. References should by typed in the newer, simpler style recently adopted by the *Astrophysical Journal* and other major astronomical publications (Abt, H. A. 1990, ApJ, 357, 1). We intend to carry this through in the *Newsletter's* bibliography in future issues.

I wish you a very cheerful holiday season and a happy and productive 1995, and look forward to publishing the first reports on your research activities in the *Newsletter*.

Gerrie Peters, Editor-in-Chief

1.2. Using The Electronic Journal

This issue marks the second distribution of the electronic version of the *Be Star Newsletter*, and we hope readers are pleased with this faster method of publication. Our plan is to restrict the paper distribution of the *NL* to libraries and subscribers who prefer receiving the paper version, so please contact me using the form enclosed with the postal mailing of this issue (or by other means) if you wish to receive the paper version.

One of the features of the World Wide Web version of the *NL* (at Uniform Resource Locator address `http://chara.gsu.edu/BeNews/intro.html`) is that there is a *Comments* section following each contribution so that you can reply to the author's ideas. This is an ideal way to develop a dialogue about issues and observations. Unfortunately, no one has yet elected to send me their comments, but I hope that this will become a useful tool for discussion. Your comments will be posted with both the WWW version and in a *Comments* file with the plain text version of the *NL* (available using anonymous ftp from `chara.gsu.edu`, in directory `BeNews`).

Electronic subscribers already received two notes from the *What's Happening?* section of the *NL* that were too important to delay announcement. I will continue to distribute important discoveries and announcements that you send me *as soon as I receive them*; these will also appear in the next regular issue of the *NL*.

Please remember to send me any changes in your e-mail address.

Douglas R. Gies / gies@chara.gsu.edu

1.3. Loss of Dr. Jiri Horn

Dear friends,

I have the sad duty to inform you that our many-year fellow, friend and a fine, brilliant but remarkably modest colleague Dr. Jiri Horn has passed away on a dull, windy day of December 13, 1994. Jiri had suffered a series on heart attacks this summer and, in spite of all efforts of the physicians, the situation got out of control. He leaves behind his wife and three adult children. He was always willing to help and the Stellar Department will never be the same without him.

I inform you with the permission and on request of his wife, Mrs. Jirina Hornova, Kutnohorska 95, 251 62 Mukarov, Czech Republic.

Best regards,

Petr Harmanec / hec@sunstel.asu.cas.cz

2. WORKING GROUP MATTERS

2.1. IAU Working Group on Active B Stars

Myron A. Smith
Working Group Chairman
e-mail: BEIAU@iuegtc.gsfc.nasa.gov

I have begun an effort to reach the community through an e-mail distribution list; if, by chance, you have not heard from me and you are interested in the activities of the Working Group, please contact me at the address above. I have had a little trouble with e-mail addresses with those who formerly had BITNET addresses. I include below a list of names for whom e-mail addresses do not seem to work. I am asking those living in a given person's country to send me an e-mail with his/her correct address; there may be a special temporary problem with India. Taking care of these "lost sheep" matters will take up a lot of my time at first, so please be patient in waiting for more than a quick acknowledgment.

Let me also list the addresses of members of the Organizing Committee of this WG. The following were elected via electronic ballot just before the Den Haag meeting of the IAU in August:

msmith@iuegtc.gsfc.nasa.gov	Myron Smith[a]
dbaade@eso.org	Dietrich Baade
cassinelli@madraf.astro.wisc.edu	Joe Cassinelli
gies@chara.gsu.edu	Doug Gies, NL Tech. Ed.[a]
garmany@jila.colorado.edu	Katy Garmany, Comm. #45 Liaison
hec@sunstel.asu.cas.cz	Petr Harmanec[a]
huib@astro.uva.nl	Huib Henrichs
marlboro@uwo.ca	Mike Marlborough
rensw@astro.uva.nl	Rens Waters[a]
lab@saao.ac.za	Luis Balona, Outgoing Chair, ex-officio[a]
peters@hyades.gsfc.nasa.gov	Gerrie Peters, NL Scient. Ed., ex-officio[b]

[a] 2nd & final three year term expires in 1997
[b] ex-officio membership as editor

Please feel free to direct your comments on WG matters to any of the above or to me. There are minutes of the general WG meeting held in Den Haag on 8/20/94. If you wish to receive them, please contact me at the above address.

Historically this WG was spawned from IAU Commission 45 (Stellar Classification), but last month I formally requested affiliation with Commissions 27, 29, and 36 (Variable Stars, Stellar Spectra, Stellar Atmospheres); their approval is pending. I expect no problem with this as the mood of the IAU is currently to conduct more business through, via, and among WGs.

You should all be aware of our Be Star Newsletter, which is undergoing changes at the moment. The Technical Editor, Gies, and the Scientific Editor, Peters, have published the first electronic edition of this NL in August. The Organizing Committee of this WG intends to open a discussion on possible format changes to the NL, or

possible complements to it, e.g. an electronic bulletin board. Please note that D. Gies is already managing a b/b for announcements, calls for observing participation, etc. If you have opinions on the format or content of the NL please contact your OC representative; please send b/b announcements directly to Gies. It will be the policy of the OC to make advisory suggestions to the NL editors concerning the NL's functions and general goals. Editorial decisions will of course remain with the editors.

Because we are some 250 members strong, I would like to funnel any comments you might have with a "regional representative" who is listed as follows:
East Europe and FSU (Harmanec)
W. Europe (Baade)
Australia/NZ/Canada/UK (Marlborough)
N/E. USA (Smith)
S/W. USA, Mexico (Gies)
Asia (Henrichs)
S. America/Africa (Cassinelli)
Each of the above gentlemen will serve as a conduit to collate your replies to me and/or to the NL editors. Anonymity will be preserved if requested.

The OC will try to formulate a coherent policy on NL and information exchange in the coming months. However, again bear in mind that even a strong collective wish for new services or functions cannot be brought to fruition without volunteers and contributors. I am most concerned that our editors not ever "burn out" through their dedication to service.

Another possible issue is any possible future scientific editor of the Newsletter. I have reappointed Gerrie Peters to the Scientific Editorship of the NL for one year. At the end of this period, she may wish to step down, and we will be looking for a replacement. If there are multiple candidates (including possibly Gerrie herself, should she decide to submit her candidacy anew) the OC will decide how to proceed. I will be asking formally for volunteers in several months. Right now: I AM ASKING THAT ANYONE INTERESTED IN BECOMING THE SCIENTIFIC EDITOR CONSIDER SUBMITTING YOUR CANDIDACY IN A FEW MONTHS TO THE OC. We expect the "term of office" to run for three years.

PLEASE HELP ME FIND CURRENT E-MAIL ADDRESSES FOR:

G. Bernabeu	K. Ghosh	G. Klambi	Y. Rabbia
T. Berghofer	W. Glatzel	H. Kirbiyik	Y. Romanov
P. Bonifacio	J.F. Gonzalez	M. Kiriakidis	J. Rountree
M. Bourguine	P. Gossat	H. Kjeldsen	Z. Ruzic
J. Chauville	J. Hao	T. Kogure	P. Saraswat
M. Coe	L. Huang	R. Kuschnig	D. Scigocki
H. Cugier	L. Liliev	J. Lafon	M. Shimada
P. Denissenkov	S. Jeffrey	Ph. Mathias	J. Torrejon
R. Garrido	A. Kholtygin	A. Pamyatnykh	W. Perry
Gautchy		I. Percheron	R. Zappala

3. CONTRIBUTIONS

3.1. Rapid spectroscopic variability in the Be star 48 Lib

M. Bossi, G. Guerrero, M. Scardia, and M. Tadini
Osservatorio Astronomico di Brera, Via Bianchi 46
I-22055 Merate CO, Italy

48 Lib is a well-known Be star whose circumstellar spectrum shows long term radial velocity variations with a possible quasi-period of about ten years (see Aydin and Faraggiana 1978).

The type of the observations and the results of the analysis concerning short-term variability can be summarized as follows:

1. radial velocity changes: 8.696 c/d (Ringuelet-Kaswalder 1963)
2. UBV photometry: 2.49 and 1.52 c/d (McDavid 1988)
3. *Stromgren* photometry: 2.49 c/d (Cuypers et al. 1989)
4. line profile variations (Floquet et al. 1994):

   10.6, 3.1 and 1.36 c/d in He I λ4471,

   7.5, 3.7 and 1.25 c/d in Mg II λ4481.

From this picture it is evident there is a need for new careful data to throw light on the short-term behaviour of this Be star.

Our data consist of 27 spectrograms centered at the He I λ6678 line and obtained during a five night survey at La Silla (August 3-8, 1991) using the CAT+CES+CCD (0.053 Å/pixel, resolution of 0.11 Å).

A sharp shell nucleus is the main characteristic of these spectra while eventual emission wings seem to be not present.

The frequency analysis pixel by pixel with the CLEAN algorithm pointed out the presence of 0.227 and 0.551 c/d frequencies, not found in the previous observations. We also tried to phase our profiles with the known photometric period (McDavid 1988; Cuypers et al. 1989) without any consistent results.

At last, in order to characterize the detected variations, we performed a simultaneous least-squares fit, pixel by pixel, with the two 0.227 and 0.551 c/d sinusoids. The obtained amplitudes and phases of the perturbation across the He I λ6678 line, suggest the following two conclusions:

a) the 0.227 c/d periodicity seems to involve the whole spectral line, whereas the 0.531 c/d variations affect the shell nucleus only;

b) both variabilities can be described as simple displacements, i.e., as radial velocity variations.

References

Aydin, C., Faraggiana, R.: 1978, Astron. Astrophys. Suppl. Ser. **34**, 51.
Cuypers, J., Balona, L.A., Marang, F.: 1989, Astron. Astrophys. Suppl. Ser. **81**, 151.

Floquet, M., Hubert A.M., Hubert H. and Janot-Pacheco E., Leister N.V.: 1994, in *Pulsation, Rotation and Mass-Loss in Early-Type Stars*, eds. L.A. Balona, H.F. Henrichs and J.M. Le Contel, Kluwer Acad. Publ., Dordrecht, p. 364.
McDavid, D.: 1988, Bull. American Astron. Soc. **20**, 954.
Ringuelet-Kaswalder, A.E.: 1963, Astrophys. J. **137**, 1310.

3.2. A new Be star in the open cluster h Persei

J. Fabregat[1], J.M. Torrejón[1], and G. Bernabeu[2]
[1]Dept. de Astronomía, Universidad de Valencia, 46100 Burjassot, Valencia, Spain
[2]Dept. de Ingeniería de Sistemas y Comunicaciones, Universidad de Alicante, Apdo. 99, 03080 Alicante, Spain

The study of Be stars in open clusters is an issue of special importance in addressing some fundamental and yet unsolved questions regarding this kind of object, like their evolutionary status and the origin of the Be phenomenon. The age, intrinsic colours, and distances of Be stars can be inferred from the cluster parameters, and used to test the theoretical attempts to account for their observed characteristics.

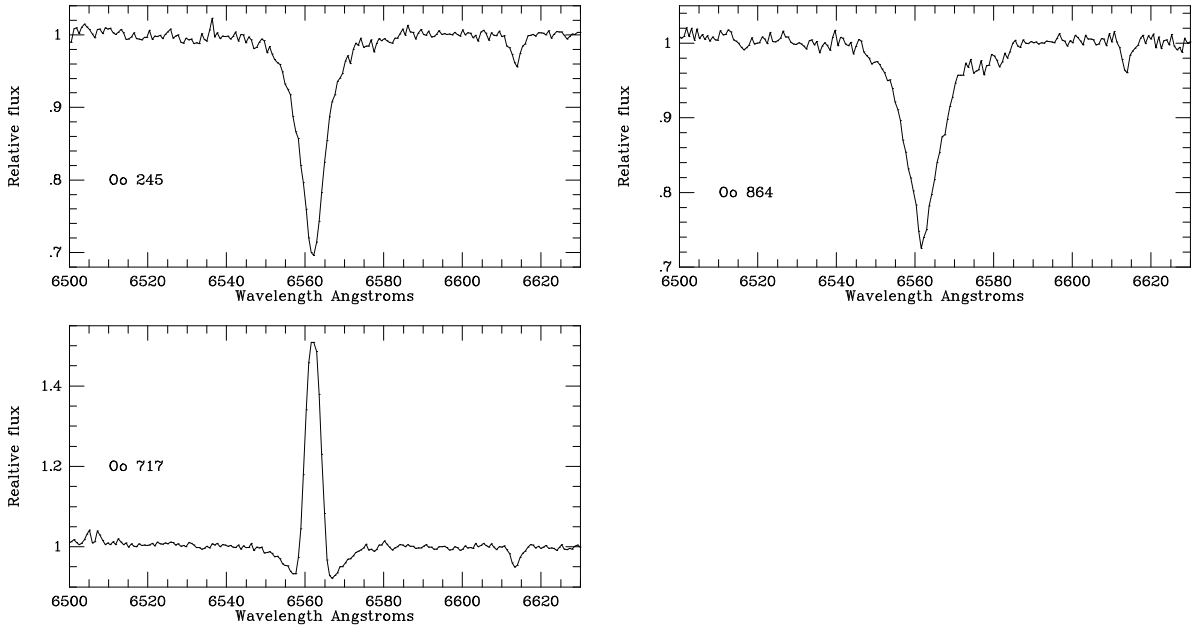
The double cluster h and χ Persei (NGC 869 and 884) is one of the richest and most extensively studied open clusters in the northern hemisphere (see Waelkens et al. 1990 and references therein). It is as well the cluster with the largest number of known Be stars, and, together with NGC 663, it presents the highest percentage of Be stars among its B star sequence.

In their photometric study of h and χ Persei, Waelkens et al. (1990) noted three stars not previously known as Be to be probable Be stars. Stars 717 (BD +56 502) and 864 (BD +56 513) presented photometric variability with similar characteristics to that exhibited by several known Be stars in the cluster. Star 245 (BD +56 481) occupies an anomalous position in the cluster HR diagram, together with four more stars which are known to be Be stars.

We have included the three stars referred to above in our photometric and spectroscopic survey of Be stars in open clusters (Fabregat et al. 1994). In this contribution we present the results of the Hα line spectroscopy, which led to the discovery of star 717 as a new Be star in h Persei. The cluster numbers used in the above paragraph and in the rest of the text are those of Oosterhoff (1937).

Observations were made on 13 December 1992 with the 2.2-m telescope of the Centro Astronómico Hispano-Alemán at the Calar Alto Observatory (Almería, Spain). The Cassegrain Spectrograph was used with the f/3 camera and grating number 11, yielding a dispersion of 60 Å/mm at 6600 Å. The detector used was the GEC#15 CCD, which gives a spectral resolution of about 1.5 Å at Hα. Data reduction was done with the STARLINK Figaro package.

The Hα profile of star 717 is shown in Figure 1. The Hα line emission is clearly seen, with single-peaked structure and equivalent width of –2.8 Å. This profile allows us to classify star 717 unambiguously as a Be star.



In Figure 1 we also show the Hα profiles of stars 245 and 864, the other suspected Be stars. In these cases the Hα line is in absorption, and thus no confirmation of the Be star nature of these stars can be given. It should be emphasized, however, that the lack of Hα emission at the time of the observation does not definitely exclude the possibility of their Be star nature. The Be phenomenon is known to be highly variable, and it is not unusual for a Be star to completely lose its circumstellar envelope, which makes its spectrum indistinguishable from normal absorption-line B star spectra.

Further monitoring of the Hα profiles will be of interest in order to definitely establish whether stars 245 and 864 are indeed Be stars, and to study the possible variability of the Hα emission in star 717.

The 2.2-m telescope of the Centro Astronómico Hispano-Alemán at the Calar Alto Observatory is operated by the Max-Planck-Institut für Astronomie.

References

Fabregat J., Torrejón J.M., Reig P., & Bernabeu G. 1994, in Pulsation, Rotation and Mass Loss in Early-Type Stars, Proc. IAU Symp. 162, ed. L. Balona, H. Henrichs, J.M. Le Contel (Dordrecht: Kluwer Academic Press), 309

Oosterhoff P.T., 1937, Ann. Sterrewatch Leiden 17, 1

Waelkens, C., et al. 1990, A&AS, 83, 11

3.3. Spectropolarimetry Requirements for B-Star Research

J. Tinbergen
Kapteyn Observatory, Roden, Netherlands

While broadband polarimetry has been used in Be-star research, the polarimetric modes available on some spectrographs appear to be under-used by the Be-star community. The purpose of this very brief note is to draw your attention to the existence of such facilities and to solicit comments on the kind of spectropolarimetric facilities you would particularly like to see implemented. My direct experience is with the facilities of the 4.2-metre William Herschel Telescope on La Palma, but my comments apply in principle to all large optical telescopes (even a Nasmyth flat can be accommodated, though it will take some calibrating).

Spectropolarimetry would be expected to yield information on scattered-light components and on magnetic fields; the required resolution will depend on the details of what one is studying (e.g., the entire star or a localised stellar wind component).

Efficient CCD spectropolarimetry (both linear and circular) at low resolution (of order 500) and medium resolution (of order 1000 to 10000) has been implemented on a few Cassegrain spectrographs; to see how it is done, you could consult User Manual No. 21 of the Isaac Newton Group, La Palma (obtainable from Royal Greenwich Observatory, Cambridge). Such spectropolarimetry is 'common-user', i.e., it does not require specialist skills other than writing a good proposal and reading a manual.

For high spectral resolution (say beyond 20000), efficient spectropolarimetry can be implemented if the spectrograph is a Cassegrain or Nasmyth system or is fiber-fed from Cassegrain or prime focus; a Coudé system is more doubtful, but see the design for the Large European Solar Telescope LEST if you are interested. For planning the design of a polarimetric module for one such spectrograph (the cross-dispersed Utrecht Echelle Spectrograph of nominal resolution 50000), I would be interested to know whether B-star observers would expect to observe only one line at a time, or (for instance) would require (or desire) SIMULTANEOUS data for the polarization of several lines widely separated in wavelength. If you have views on such requirements, please e-mail me when you read this; TINBERGEN@KSW.RUG.NL.

3.4. A comment on the circular velocity law in Be star envelopes

Ryuko Hirata
Department of Astronomy, Faculty of Sciences, Kyoto University
Sakyo-ku, Kyoto, 606-01, Japan

An attempt to derive the circular velocity law in Be star envelopes has been done using the observed equivalent width, W, and the peak separation of emission profiles, $v_{\rm p}$ (Hanuschik et al. 1988; Hanuschik 1989; Mennickent et al. 1994). Assuming that the circular velocity, $v_\phi(r)$, is expressed as $v_\phi(r) \propto r^{-j}$ as a function of distance r in

units of stellar radius and that the surface brightness is uniform over the envelope, they used an expression,

$$\log\,(\frac{v_{\rm p}}{2\ v_{\rm e}\sin i})= -\frac{j}{2}\log W + C,$$

where $v_{\rm e}\sin i$ is the projected rotational velocity of the underlying star, and the constant C involves the line emissivity, j, and the inclination effect. Using the Hα profile, Hanuschik et al. (1988) obtained $j \sim 0.8$ from 26 Be stars, and Hanuschik (1989) concluded $j \sim 0.6$ from 93 Be stars. Mennickent et al. (1994) obtained $j = 1.4 \pm 0.2$ from 71 Be stars, after correction for the photospheric component of the Hα equivalent width.

Since the density in the envelope seems to decrease outwards (e.g., Waters et al. 1987; Dougherty et al. 1994), it is highly probable that the surface brightness of the emission line also decreases outwards. Let us assume that the surface brightness of the line, $B(r)$, is expressed as $B(r) \propto r^{-m}$. Then, the proportional constant $j/2$ in the above expression is replaced by $j/(2-m)$ (see Hirata & Kogure 1984). When m is larger than 2, the equivalent width saturates, and the peak separation becomes independent from the outer radius of the envelope. The observed correlation given by Mennickent et al. (1994), that is, the slope of -0.7 in the above expression, yields $j = 0.5$ for $m = 1.3$ and $j = 1.0$ for $m = 0.6$. IRAS and near-IR observations indicate that the envelope density, ρ, varies as $\rho \propto r^{-n}$ with $n = 2 \sim 5$ (Waters et al. 1987; Dougherty et al. 1994). The values of m above are much larger than those expected in the optically thin recombination process, reflecting the optically thick nature of Hα. Because of the wide range of n and the optically thick nature of Hα, it is difficult to guess the value of m or, thus, the value of j, from the above expression.

New information on the circular velocity law has been obtained from recent interferometric observations (Mourard et al. 1989; Quirrenbach 1994). The direct measurements of the size of the Hα emitting region indicate that the envelopes for strong emission-line Be stars are larger than those guessed from the peak separation under the assumption of $j = 1$. Spectro-interferometry by GI2T (Vakili et al. 1994) will provide us with the long sought circular velocity distribution in the envelope.

References

Dougherty, S. M., Waters, L. B. F. M., Burki, G., Coté, J., Cramer, N., van Kerkwijk, M. H., & Taylor, A. R. 1994, A&A, 290, 609

Hanuschik, R. W. 1989, Ap&SS, 161, 61

Hanuschik, R. W., Kozok, J. R., & Kaiser, D. 1988, A&A 189, 147

Hirata, R., & Kogure, T. 1984, BASI, 12, 109

Mennickent, R. E, Vogt, N., Barrera, L. H., Covarrubias, R., & Ramírez, A. 1994, A&AS, 106, 427

Mourard, D., Bosc, I., Labeyrie, A., Kochelin, L., & Saha, S. 1989, Nature, 342, 520

Quirrenbach, A. 1994, in Pulsation, Rotation and Mass Loss in Early-Type Stars, Proc. IAU Symp. 162, ed. L. Balona, H. Henrichs, J. M. Le Contel (Dordrecht: Kluwer Academic Press), 450

Waters, L. B. F. M., Coté, J., & Lamers, H. J. G. L. M. 1987, A&A, 185, 206

Vakili, F., Mourard, D., & Stee, P. 1994, in Pulsation, Rotation and Mass Loss in Early-Type Stars, Proc. IAU Symp. 162, ed. L. Balona, H. Henrichs, J. M. Le Contel (Dordrecht: Kluwer Academic Press), 435

3.5. "NEWSIPS" TO THE RESCUE: A New Insight from the IUE on Activity in Lambda Eri

Myron A. Smith
CSC/IUE Observatory

Be stars undergo intermittent mass loss ejections for reasons that are not understood. Recent circumstantial evidence points to explosive energy releases from magnetic flare releases. The "jury is still out" but the following arguments concerning λ Eri (B2) support this picture.

Lambda Eri is a mild Be star whose photosphere is unobscured most of the time. It has been the target of numerous optical monitoring campaigns for this reason. Studies of optical He I lines show the strong He I λ6678 line to be in a state of almost continuous, erratic variability and to undergo in particular "dimple"-shaped distortions in the line profile. In addition, a ROSAT observation detected a giant X-ray flare. Although the duty cycle and timescales of the flare correspond to characteristics of the optical line dimples, no connection has been established between them.

We have processed 42 IUE observations of λ Eri obtained during three nights of an optical/IUE campaign in 1990 with both IUESIPS and prototype NEWSIPS software. Equivalent width measures of the He II λ1640 ("Hα") line show a large scatter from the old IUESIPS processings, so large that it is difficult to tell whether there is any real variation at all. In contrast the NEWSIPS data show smaller errors, and sudden decreases in the line strength from a "basal" value of 0.55 Å are obvious. The smaller NEWSIPS errors result from smaller photometric errors and the far better defined continua near the He II λ1640 line.

Can we trust the NEWSIPS results over the IUESIPS results? Yes, because they correlate with the appearance of new optical line dimples: each dip in He II λ1640 strength correlates with the emergence of new dimples in the He I λ6678 line. Actually, these He II λ1640 strength changes *precede* the dimple appearances by 20-30 minutes, suggesting that He II λ1640 activity coincides with an initial cause of the dimples. [Smith & Polidan (1993, ApJ, 408, 323) argue that dimples are the result of elevated, condensed slabs over the atmosphere; these take $\sim$ 20 minutes to develop.]

The rapidity of the He II λ1640 strength decreases makes it clear that they are manifestations of localized emissions on the star. As is well known, similar emissions in H-alpha of He II are most likely caused by ionization to He III and recombination. Recent work by J. MacFarlane shows that the most likely cause of excess He II ionizations in B star atmospheres is X-ray flux. In the context of λ Eri, X-ray variability probably means "flaring." Thus, it seems that the He II λ1640 activity, that NEWSIPS permits us to detect, follows high energy variability in this star. Much of this high energy is transformed into UV line emission and mechanical energy, which is observed in optical lines. These arguments suggest that transient high energy processes are associated with episodic emission and mass loss in at least some Be stars.

There appears to be more than one parameter in the process. For example, separate observations in 1987 show a constant He II λ1640 line strength even when the He I λ6678 line undergoes dramatic changes in emission. Clearly, He I emission is not

directly linked to He II emission and soft X-rays. What could be the additional parameter or condition that causes He II λ1640 not to show emission when He I λ6678 does?

4. WHAT'S HAPPENING?

4.1. Request for Observations in Support of WUPPE / Astro-2

Karen S. Bjorkman and Joni Johnson
University of Wisconsin, Space Astronomy Laboratory
6219 Chamberlin Hall, 1150 University Avenue
Madison, WI 53706-1390 USA
Phone: 608-263-4680, FAX: 608-263-0361

The second flight of the Wisconsin Ultraviolet Photo-Polarimeter Experiment (known as WUPPE) aboard the Astro-2 mission on the space shuttle Endeavour is scheduled for early 1995. WUPPE will make spectropolarimetric observations of many types of objects in the ultraviolet from 1500-3200 Å. WUPPE has scheduled a number of Be stars for observation during this mission. Since results from Astro-1 showed some surprises for Be stars (Bjorkman et al. 1991, ApJ, 383, L67; Bjorkman et al. 1993, ApJ, 412, 810; Bjorkman 1994, IAU Symp. 162, 219), and since our ground-based support data proved to be so important to analysis of the WUPPE data, we are again requesting support observations from interested observers in the Be star community. We will also be obtaining contemporaneous IUE data during the Astro-2 mission.

Ground-based observations of particular interest would include medium-to-high resolution optical spectroscopy, especially of Hα, broad-band optical and infrared polarimetry, and optical and infrared photometry. The current launch date for Astro-2 is set for **23 Feb 1995**, although this date is likely to slip to **2 Mar 1995**, and the schedule is subject to change. Interested observers can contact Karen Bjorkman (karen@sal.wisc.edu) or Joni Johnson (jjj@sal.wisc.edu) by e-mail or post (see address above) for more information and for the WUPPE target list of Be stars. Other objects, such as OB supergiants and Herbig Ae/Be stars will also be observed, and support observations are also welcome there. Karen is responsible for the Be star observations, and Joni is coordinating all ground-based support observations. Observers will be notified of any changes in the launch date or target list via e-mail (or by post or fax if preferred).

4.2. X-ray Observations of Lambda Eridani

Myron Smith
msmith@iuegtc.gsfc.nasa.gov

I have been informed by the ROSAT Project that X-ray High Resolution Imaging

observations of λ Eri are scheduled for several orbits during **26 February - 1 March 1995**. Some additional time will be carried over into the early fall of 1995.

I have also just been informed by a contact with the ASCA Project that X-ray observations (spectra) are being scheduled for the **week of 11 March, 1995** (no more precise dates are available yet).

We currently have in place some optical coverage for the ROSAT nights at Kitt Peak and in India. We urgently need observations for the beginning of these nights (as well as for nights in mid-March) to support the X-ray coverage. After all, if the star X-ray flares again we will want to know whether there are optical signatures either in the lines or continuum.

Should you have any access to telescopes during the early evenings of these nights and would like to contribute to an understanding of the X-ray- optical connection in Be stars, please contact me. Thank you!

[P.S. Recently HST time was granted for 14 orbits of monitoring of γ Cas. I will be making a similar but more timely request next year for ground support, which we may also be able to augment with X-ray coverage.]

4.3. Multiwavelength Campaign on Alpha Eridani

Gerrie Peters
Space Sciences Center, USC
peters@hyades.dnet.nasa.gov

To complete our long-term study of the phenomenon of rapid photometric and spectroscopic variability in Be stars, we have been granted five *IUE* shifts from NASA in the 18th Episode of the *IUE* Guest Observer program to observe α Eri, a Be star that displays unusually large flux variations in the far UV ($\sim$30% peak-to-peak at $\sim$ 1000 Å) with a period of 1.28 days (Holberg et al. 1994, preprint). Participants in this project include J. R. Percy, H. F. Henrichs, D. R. Gies, D. McDavid, and G. J. Peters. We invite members of the community to join a multiwavelength campaign that will be centered around the *IUE* coverage, which will will span 40 continuous hours. Especially needed are ground-based spectroscopic, photometric, and polarimetric observations from observing sites that have a good distribution in longitude. Although the exact dates for the *IUE* observations are not yet set, we would like to carry through the program in **late August or early September 1995**. Since we would like to firm up the *IUE* dates within the next month, please contact either John Percy, Department of Astronomy, University of Toronto, Toronto, Ontario, M5S 1A1, Canada (photometric observations) or Gerrie Peters, Space Sciences Center, University of Southern California, Los Angeles, CA 90089-1341, USA (spectroscopic observations) as soon as possible if you would like to participate in this campaign. Of course, in addition to simultaneous observations, we are also interested in the pre- and post-campaign behavior of the star.

4.4. Activity in o Andromedae

P. Harmanec
Astronomical Institute, Ondrejov
Reprinted from IAU Circular No. 6082 (1994 September 26)

A series of Reticon observations (619-672 nm) of the B6 IIIe star *o* And (the primary of a multiple system), secured at the coudé focus of the Ondrejov 2.0-m telescope on Sept. 22/23, shows a dramatic change of the line spectrum in comparison to the previous spectrum of *o* And obtained with the same instrumentation on Aug. 3/4. New spectra show a double Hα emission with peaks rising some 2-3 % above the continuum level and a shell absorption with central intensity 0.31, while the August spectrum has Hα in absorption, with a shell core at central intensity 0.37. The total equivalent width of Hα has decreased from 0.628 to 0.416 nm. Other stellar features seen in both August and September spectra are Si II (multiplet 2) lines at 634.7 and 637.1 nm, He I at 667.8 nm, and as-yet-unidentified broad absorption at about 640.06 nm; the Si II and He I lines are stronger in the new spectra. Difference spectra of the present series (created by subtraction of the first spectrum from the remaining ones) reveal the presence of strong rapid variations in all observed stellar lines, with the exception of the unidentified 640-nm feature. The radial velocities of H and He are about -19 km s^{-1} on both occasions, while those of the Si II lines are -20 and -10 km s^{-1} from the new spectra; all measurements refer to line wings.

4.5. o And: Confirmation of a New Emission-Line Episode

A. Arellano-Ferro
Instituto de Astronomia, Universidad Nacional Autonoma de Mexico

Michele Bossi and Gianantonio Guerrero
Osservatorio Astronomico di Brera, Italy
e-mail: guerrero@astmim.mi.astro.it

High resolution spectra ($R = 17000$) of the Be star *o* And were obtained on the night September 23-24, 1994, using a CCD detector and a Cassegrain Echelle spectrograph applied to the 2.1-m telescope of the San Pedro Martir Observatory, UNAM (Baja California, Mexico). Our observations have been made one night after those obtained by Harmanec and recently reported in "Be Star Newsletter: What's Happening Update" (see preceding note from Harmanec). We confirm that *o* And developed two emission peaks in the wings of Hα, rising some 4% and 9% above the continuum for the blue and the red peak, respectively (the corresponding value indicated by Harmanec were some 2-3%). Moreover the central intensity in our spectra was 0.22 as opposed to 0.31 for the previous night. So we have to point out that a rapid intensification of the emission episode seems to have occurred in that period.

4.6. A New Strong Emission Episode of Lambda Eri

S. Štefl
Astronomical Institute, Academy of Sciences
CZ-251 65 Ondrejov, Czech Republic
Reprinted from IAU Circular No. 6098 (1994 October 26)

Two Reticon observations (620.0-672.0 nm) of the well-known B2 IVe star λ Eri were obtained at the coudé focus of the 2-m telescope of the Ondrejov Observatory on October 19 and 21, 1994. They show extraordinarily strong emission activity not only in hydrogen Hα but also in He I 667.8 nm and Si II lines.

Hα has a double-peak emission profile with V and R emission peak intensities of 1.37 and 1.38, respectively, of the continuum level. The bottom of the shell absorption declines to about half of the emission, has radial velocity of 12 km s^{-1}, and shows different asymmetry in two spectra separated by 2 days.

The violet and red emission wings of He I 667.8 rise 2% above the continuum level. Emission up to 0.5% of the continuum can be recognized also in the Si II 634.3 and 637.1 lines.

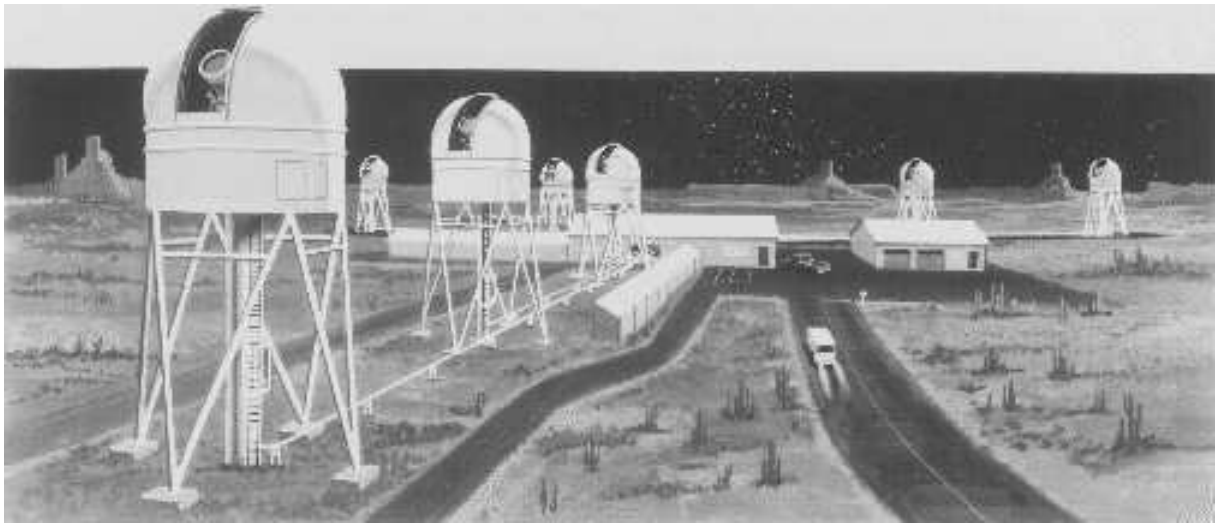
The last emission activity of the star was observed in January 1994 (Štefl, S., 1994, Be Star Newsletter No. 28, 5). A concentrated observing effort is desirable, assuming that the new emission activity will persist - like the last one - only for several weeks or a few months. A multi-site observing campaign on λ Eri is scheduled in the period November 12-18, 1994 (Hirata, R., 1994, Be Star Newsletter No. 28, 11).

4.7. Georgia State University Receives NSF Grant Towards the Construction of an Interferometric Array

H. A. McAlister, Director
Center for High Angular Resolution Astronomy
Georgia State University
Atlanta, GA 30303
e-mail: hal@chara.gsu.edu

The National Science Foundation has awarded $5.5M to Georgia State University in partial support of an $11.3M optical/IR array. The remaining funds for the facility and the base operating expenses are guaranteed by GSU. The grant followed a 10-year effort by GSU's Center for High Angular Resolution Astronomy (CHARA) to greatly expand beyond its work in single aperture speckle interferometry by designing and constructing a two-dimensional array of 1-m aperture telescopes that would achieve sub-milliarcsecond resolution at visible wavelengths. The NSF had supported a feasibility study and a preliminary engineering design phase prior to making this construction award.

Because of the level of available funds, the "CHARA Array" was reduced from its proposed seven-telescopes to an array of five telescopes to be arranged in a VLA-type configuration enclosed by a 400-m diameter circle. The array has been designed to



provide uniform, non-redundant coverage of the (u,v) plane, and the selection of the maximum baseline resulted from an analysis of science driver requirements. The light collecting telescopes will be afocal optical system with alt-az mounts with output beams directed through evacuated light pipes to a central beam combining station. The selection of 1-m apertures resulted from an expectation that a good site would occasionally deliver diffraction-limited seeing conditions at such an aperture at 2.2 microns and that 1 meter is sufficiently large to make adaptive optics an interesting add-on for visible light performance enhancement.

The central station will provide the required path length compensation systems as well as a variety of other subsystems for alignment, metrology, fringe tracking, and visible and IR interferometry and imaging. The central facility will be constructed to accomodate up to eight telescopes as it is CHARA's goal to find sufficient funds to at least complete the originally proposed seven-telescope array and have a spare light channel for future expansion. The budget will initially permit fringe visibility measurements and limited detection of closure phases, and the full implementation of closure phase imaging at visible and K bands will be deferred or reduced in scope from the original plans for separate visible and IR imagers.

The CHARA Array will have exceptional capabilities for fundamental stellar astrophysics with its ability to resolve stars at all locations (except for hot subdwarfs and white dwarfs) on the HR diagram. The visible-light limiting resolution of 0.2 milliarcseconds will also permit the resolution of the majority of the known spectroscopic binaries. Thus masses, diameters, effective temperatures, and orbital parallaxes will result in great numbers. The principal application at K-band will be the imaging of pre-main sequence and young stellar objects. CHARA's NSF proposal outlines a broad research program encompassing many areas of stellar astrophysics and also offers the possibility of limited application to the resolution of the cores of galaxies and AGN's.

The site for the facility has not been formally agreed upon at the time of this writing, but it is anticipated that the Array will be located on a high-elevation site in New Mexico. It is anticipated that "first fringe" will occur sometime in 1999.

For additional information concerning the CHARA Array, interested readers can consult the GSU/CHARA Mosaic homepage by accessing `http://chara.gsu.edu`. The final technical report to the NSF sponsored engineering design study is available through this access.

4.8. Hot Star Newsletter

Volumes 3 and 4 of the admirable *Hot Star Newsletter* have now been distributed by its editor, Philippe Eenens. They contain abstracts of recent papers, notices of future meetings, and a description of the IUE MEGA Project, a dedicated campaign (January 1995) to study the instabilities in the winds of massive stars. To subscribe to this electronic newsletter, contact Philippe Eenens at:
`eenens@tonali.inaoep.mx`

5. PREPRINTS RECEIVED

Multi-wavelength observations of the Be star/X-ray binary EXO2030+375 during outburst

A.J. Norton, D. Chakrabarty, M.J. Coe, C. Everall, M.H. Finger, T.A. Prince, P. Roche, M.T. Stollberg and R.B. Wilson
MNRAS (in press)
e-mail: mjc@phastr.soton.ac.uk

We present the results from a campaign to monitor the behaviour of the Be star/X-ray binary EXO2030+375 during an X-ray outburst. The BATSE all sky monitor on board the Compton Gamma-Ray Observatory satellite regularly detects pulsed emission from EXO2030+375 when the neutron star is near periastron. Ground based optical spectroscopic data plus infrared photometric and polarimetric data were obtained simultaneously with these X-ray data during a typical outburst in 1993 June/July. Despite an increase in the pulsed X-ray flux by an order of magnitude, neither the infrared luminosity nor the equivalent width, strength or profile of the H alpha emission line showed any significant, correlated changes. We conclude that (i) reprocessing of the X-ray flux in the Be star circumstellar envelope, (ii) gravitational disruption of that envelope by the neutron star and (iii) enhanced emission from an HII region formed around the neutron star are all minimal effects and below our detection threshold. We have also detected significant linear polarisation in the infrared flux from EXO2030+375, and we discuss whether or not some fraction of this is intrinsic to the source.

Discovery of the optical counterpart to the CGRO transient GRO J1008-57

M.J. Coe, P. Roche, C. Everall. J. Fabregat, D.A.H. Buckley, R. Chris Smith, A.P. Reynolds, I.D. Jupp and H.T. MacGillivray

MNRAS (in press)
e-mail: mjc@phastr.soton.ac.uk

We report observations which identify the optical/IR counterpart to the X-ray transient GRO J1008-57. The counterpart is shown to be an OB star with a strong IR excess and Balmer emission lines, suggesting a Be-type primary. No evidence is found for variability in the H alpha emission line over a period of 3 months following the discovery of the counterpart in Dec. 1993.

Multiwaveband Study of a Major X-ray Outburst from the Be/X-ray Transient System A1118-616

M.J. Coe, P. Roche, C. Everall, G.J. Fishman, K.S. Hagedon, M. Finger, R.B. Wilson, D.A.H. Buckley, C. Shrader, J. Fabregat, V.F. Polcaro, F. Giovannelli and M. Villada
1994, A&A, 289, 784
e-mail: mjc@phastr.soton.ac.uk

The Be/X-ray binary system A1118-616 has been observed to undergo a major outburst in January 1992 by the BATSE all-sky monitor on the Compton Gamma Ray Observatory. Ground-based optical and IR observations, supported by UV observations obtained under an IUE Target of Opportunity programme, have provided us with an excellent multi-wavelength study of this system to complement the X-ray data set. The results from this campaign are presented showing the details of the X-ray timing studies, the very strong Hα emission and the bright IR excess from the Be star's circumstellar disk (the fuel for the accretion process). Implications for the physics of the system are discussed.

Photometric and H-alpha Observations of LSI+61 303: Detection of a 26 day V and JHK band modulation

J.M. Paredes, P. Marziani, J. Marti, J. Fabregat, M.J. Coe, C. Everall, F. Figueras, C. Jordi, A.J. Norton, T. Prince, V. Reglero, P. Roche , J. Torra, S.J. Unger and R. Zamanov
A&A (1994) 288, 519
e-mail: mjc@phastr.soton.ac.uk

We present new optical and infrared photometric observations and high resolution H alpha spectra of the periodic radio star LSI 61 303. The optical photometric data set covers the time interval 1985-1993 and amounts to about a hundred nights. A period of 26 days is found in the V band. The infrared data also present evidence for a similar periodicity, but with higher amplitude of variation (0.2). The spectroscopic observations include 16 intermediate and high dispersion spectra of LSI 61 303 collected between January 1989 and February 1993. The H alpha emission line profile and its variations are analyzed. Several emission line parameters – among them the

H alpha EW and the width of the H alpha red hump – change strongly at or close to radio maximum, and may exhibit periodic variability. We also observe a significant change in the peak separation. The H alpha profile of LSI 61 303 does not seem peculiar for a Be star. However, several of the observed variations of the H alpha profile can probably be associated with the presence of the compact, secondary star.

The archetype line-profile variable ϵ 45 Per is a spectroscopic triple system

A.E. Tarasov, P. Harmanec, J. Horn, L.S. Lyubimkov, S.I. Rostopchin, P. Koubsky, C. Blade, V.V. Kostunin, G.A.H. Walker, and S. Yang
A&A (in press)
e-mail: tarasov@crao.crimea.ua

An analysis of 66 old and 651 recent electronic and photographic spectrograms of the archetype line-profile variable ϵ Per led to the following conclusions:
1. ϵ Per is the primary component of a binary system. There are radial-velocity variations with a full amplitude of $\sim$ 30 km s^{-1} with a period of 14.076 d which can be traced back to old Allegheny observations from 1907-1912. The orbit is not circular but has a high eccentricity of 0.540 ± 0.045.
2. The 14-d binary system probably moves in orbit with a distant, as yet unknown third star (which is not identical to the visual component ADS2888B). A likely period is 4156 d which then leads to an eccentric orbit with $e = 0.40 \pm 0.26$ but several longer periods are also possible. The existence of the putative third component to ϵ Per could easily be checked by speckle-interferometric observations since its expected angular distance from the close pair in the sky does not decrease below $\approx 0''.04$ even at periastron (for the shortest possible periods).
3. Some basic physical elements of the component stars and system dimensions were estimated as follows: primary: mass $(13.5 \pm 2)\ M_\odot$, radius $(6.9 \pm 0.2)\ R_\odot$, B0.5 IV-III, $T_{\rm eff} = (27600 \pm 1000)$ K, $\log g = 3.85 \pm 0.15$ [CGS], He/H = 0.23, $\log \epsilon$(O) = 8.89, $\log \epsilon$(Si) = 7.51; secondary: mass between 1 and 2 $M_\odot$; tertiary: mass between 2.3 and 5.3 $M_\odot$. The semimajor axis of the 14-d orbit is about 60 $R_\odot$, that for the wide orbit 2800 $R_\odot$ or more (depending on what is the correct value of the period). The data presented here make the membership of ϵ Per in the α Per cluster very improbable.

Line profiles and intensity maps from an axi-symmetric radiative wind model for Be stars

Ph. Stee and F.X. de Araújo
email: stee@rossini.obs-nice.fr

We present theoretical line profiles and intensity maps from an axi-symmetric radiative wind model in which the relative contribution of thin lines increases from pole to equator. The introduction of a viscosity parameter enables us to consider the effects of a viscous force in the azimuthal component of momentum equations.

The model gives a hydrogen density law and velocity fields ($v_r(r,\theta)$ and $v_\phi(r,\theta)$) having assumed a temperature distribution. The ionization-excitation equilibrium is computed within the Sobolev approximation. The line profiles derived indicate that asymmetric double-peaked emission lines results from an expanding and rotating wind. The widths at half maximum of our profiles however are too large due to the strongly accelerated radial flow present in the equatorial region. On the other hand they may provide an alternative explanation for the extended wings observed in some Be stars. The intensity maps show different morphologies in Hα and Hβ bands. With the advent of new interferometric data the comparison of intensity maps with high angular measurements may be an important test for Be star models.

Interpretation of the Long-Term Variation in Late-Type Active Be Stars

Ryuko Hirata
submitted to PASJ
email: hirata@kuastro.kyoto-u.ac.jp

It is shown that the long-term photometric variation of Pleione is composed of those in a very opaque region and the envelope. These two components behave differently, implying different origin. The weakening of Balmer photospheric lines and their recovery vary in phase with the photometric variation in the opaque region. This suggests that the opaque region is an extended photosphere. In the activity cycle of Pleione, this extended photosphere is first formed, then the envelope develops under the background of rapid formation and gradual recovery of the extended photosphere. The photometric variation of the extended photosphere can be described in terms of gravity darkening effect in the equatorial rotational acceleration. We also examined two other late-type Be stars, 88 Her and κ Dra, and obtained the same conclusion.

Long-term Photometry of Be Stars I: Fading Events and Variations on Time Scales of Years

R.E. Mennickent, N. Vogt, and C. Sterken

Strömgren differential *uvby* photometry of 7 Be stars was analyzed. The data were taken during 1983-1991 by the Long-Term Photometry of Variables team at La Silla. Two low $v \sin i$ stars (27 CMa and 28 CMa) showed fading events—that is, sudden fading of a few weeks duration—that were preceded by quasi-periodic oscillations (QPO) on time scales T $\sim 10 - 20$ days and amplitudes up to $0\overset{\mathrm{m}}{.}2$. In both cases the color variations indicated occurrence of dust ejections. QPO were observed also in 48 Lib and in ϵ Cap, but these were not related to any fading event. Long-term photometric variations up to $0\overset{\mathrm{m}}{.}6$ amplitude were seen for all stars. In most cases, these variations were larger in the u band, the stars being bluest when brightest. The Be stars seems to follow a fixed track in the c_1 - $(b-y)$ color plane. The $b-y$ color is not very sensitive to changes in brightness, whereas the c_1 color is strongly correlated with the u magnitude. Moreover, the largest c_1 changes, compared with u changes,

occured in high $v \sin i$ Be stars with shell characteristics. Additional variations on time scales of days were always present; these were larger in the u band. HR 3237 shows peculiar photometric variations, being the exception to the behaviour above described. The amplitudes of short-term and long-term variations of 13 Be stars are correlated; the tightest correlation was found in the y band. We discuss long-term photometric variations and quasi-periodic oscillations as due to enhanced mass loss episodes preceded by global one-armed thin-disk oscillations, which could be excited by some type of photospheric activity.

Evidence for Ellipsoidal Variations of the Be star binary HD 50123

C. Sterken, N. Vogt, and R. Mennickent

On the basis of 8 years of photoelectric monitoring in the Strömgren system we were able to establish that HD 50123 is an interacting binary consisting of a B6 Ve primary and an early K giant secondary which fills its Roche lobe. The orbital period is 28.601 days. The secondary contributes considerably to the flux in the y and b bands, in which the double-sinusoidal light curve typical for ellipsoidal variables is seen. A few published radial velocities of the primary are consistent with a semi-amplitude of $K_1 = 25 \pm 6$ km s^{-1}, and a mass function $f(M) = 0.046 \pm 0.026\, M_\odot$. Preliminary estimates of the stellar masses give 5 and 1.5 $M_\odot$, respectively, for primary and secondary. Some implications for the binary interpretation of Be stars, as well as for the period distribution of ellipsoidal variables, are discussed.

Toward a consistent model of the B0.5 Ve + sdO6e binary Phi Persei

H. Božić, P. Harmanec, J. Horn, P. Koubský, G. Scholz, D. McDavid, A. M. Hubert, and H. Hubert
e-mail: hec@sunstel.asu.cas.cz

A detailed analysis of a very rich collection of spectroscopic and photometric observations of the bright Be star ϕ Per is presented. Earlier reports that ϕ Per is a double-lined spectroscopic binary consisting of two emission line objects are confirmed. An orbital solution based on the emission-wing radial velocities for boh stars has led to the first determination of the orbital elements which defines the correct orbital phases. All data since the beginning of this century can be reconciled with a constant orbital period of $126\overset{\mathrm{d}}{.}6731 \pm 0\overset{\mathrm{d}}{.}0071$. The new orbital solution gives lower masses than those found by earlier investigators, namely $M_1 \sin^3 i = 16.35\ M_\odot$ and $M_2 \sin^3 i = 1.69\ M_\odot$. These masses are in agreement with the recently derived spectral classes B0.5 Ve and sdO6e for the primary and secondary, respectively.

Long-term light variations are positively correlated with the emission strength, and in the $U-B$ vs. $B-V$ diagram the object has changed its apparent photometric type from a B supergiant toward an MS object. Dereddening of the mean seasonal UBV magnitudes from recent years (when spectra show the weakest recorded Balmer emission) leads to a photometric spectral type a bit earlier than B1 V. An important

and exciting finding is that the emission lines *of both stars* have been weakening simulaneously in recent years, which seems to indicate some kind of interaction between the binary components.

The presence of rapid light variability is confirmed, but its more detailed analysis is postponed for another study. Low-amplitude orbital light variations with rather complicated light and color curves are found after the removal of long-term and rapid changes. The principal maxima and minima of the orbital light curves can be traced in both old and new photometry and can probably be attributed to specific circumstellar structures whose signatures are seen spectroscopically.

Finally, systemic secular changes in the shape and amplitude of the orbital radial-velocity curve of the Balmer shell lines are found, based on 1024 radial velocities spanning nearly a century.

Winds from Rotating Wolf-Rayet Stars: The Wind-Compressed Zone Model

J. P. Cassinelli, R. Ignace, and J. E. Bjorkman
e-mail: cassinelli@madraf.astro.wisc.edu

Theoretical models for Wolf-Rayet winds that include the effects of rotation and magnetic fields are discussed. These are of two types: magnetic rotator models and wind-compression models. The magnetic rotator models are examples of equatorial expulsion models, typically requiring large rotation rates to produce significant equatorial density enhancements. Wind-compression models are introduced here as an application of the two-dimensional Wind-Compresed Disk (WCD) model that has recently been developed for Be stars. An equatorial disk forms because of the supersonic confluence of the flow from the upper and lower hemispheres of the star. In application to WR stars, we suggest that disk formation is not required, and instead a less extreme example that we call a wind-compressed zone (WCZ) may suffice. Because the winds of WR stars have a geometrically extended acceleration region, or a "slow" velocity law, there can be compressions by an order of magnitude, even with moderaate stellar rotation rates of about 16% critical. Magnetic flux conservation is then used to estimate the enhancement in field strength that occurs because of the equatorial wind compression. We consider an application of the model to explain the occurrence of polarization and dust formation among only some WR stars. Finally, we consider the WR/compact companion system WR 147, and suggest that the enhanced accretion in a WCZ could help explain the large X-ray emission.

6. BIBLIOGRAPHY

(Compiled by D. R. Gies, A. M. Hubert, J. Jugaku, and G. J. Peters)

X-Ray Emission from Be Star X-Ray Binaries
APPARAO K.M.V.: SSR 69, 255 (1994)

A New Be Phase of Pleione
BALLEREAU D. - CHAUVILLE J. - ZOREC J.: IBVS 4095 (1994)

Pulsation, Rotation and Mass Loss in Early-Type Stars, Proceedings of IAU Symposium No. 162
ed. BALONA L. A. - HENRICHS H. F. - LE CONTEL J. M.: Dordrecht, Kluwer Academic Publishers
Congratulations to the editors and organizers of IAU 162 on this splendid publication

Dust around Herbig Ae/Be Stars: IRAS Low Resolution Spectra
BHATT H.C. - GORTI U.: BASI 21, 541 (1993)

Spectroscopy and Photometry as a Synergetic Approach to the Study of Stellar Pulsations
BOSSI M. - GUERRERO G. - MANTEGAZZA L. - PORETTI E. - RE R.: RMAA 29, 158 (1994)

Investigation of the Be Star Phenomenon using the Denis Data
BREITFELLNER M.G. - ZOREC J.: ASS 217, 225 (1994)

X-Ray Emission from Near Main Sequence B Stars
CASSINELLI J.P. - COHEN D.H. - MacFARLANE J.J. - SANDERS W.T. - WELSH B.Y.: APJ 421, 705 (1994)

Ultra-Rapid Variability in γ Cas and λ Eri
CHAKRABORTY A. - ANANDARAO B.G. - SWAMINATHAN R.: BASI 21, 561 (1993)

Multiwaveband Study of a Major X-Ray Outburst from the Be/X-Ray Transient System A1118-616
COE M.J. - ROCHE P. - EVERALL C. - FISHMAN G.J. - HAGEDON K.S. - FINGER M. - WILSON R.B. - BUCKLEY D.A.H. - SHRADER C. - FABREGAT J. - POLCARO V.F. - GIOVANNELLI F. - VILLADA M.: AA 289, 784 (1994)

Kinematics of Hot Subdwarfs
COLIN J. - DEBOER K.S. - DAUPHOLE B. - DUCOURANT C. - DULOU M.R. - GEFFERT M. - LECAMPION J.F. - MOEHLER S. - ODENKIRCHEN M. - SCHMIDT J.H.K. - THEISSEN A.: AA 287, 38 (1994)

On the Characteristics and Origin of the Expansion of the Local System of Young Objects
COMERON F. - TORRA J. - GOMEZ A.E.: AA 286, 789 (1994)

Chemical Evolution of the Orion Association. II. The Carbon, Nitrogen, Oxygen, Silicon, and Iron Abundances of Main Sequence B Stars
CUNHA K. - LAMBERT D.L.: APJ 426, 170 (1994)

An Atlas of Southern MK Standards from 5800 TO 10,200 Å
DANKS A.C. - DENNEFELD M.: PASP 106, 382 (1994)

Radiative Wind Models with Azimuthal Symmetry. II. A Latitude-Dependent Wind for Be and B[E] Stars
DEARAUJO F.X. - PACHECO J.A.D. - PETRINI D.: MNRAS 267, 501 (1994)

Turbulent Diffusive Mixing in Early B-Type Main-Sequence Stars
DENISSENKOV P.A.: AA 287, 113 (1994)

An IUE Survey of Interstellar H I Lyα Absorption. I. Column Densities
DIPLAS A. - SAVAGE B.D.: APJS 93, 211 (1994)

Near-IR Variability of Be Stars
DOUGHERTY S.M. - TAYLOR A.R.: MNRAS 269, 1123 (1994)

Near-IR Excess of Be Stars
DOUGHERTY S.M. - WATERS L.B.F.M. - BURKI G. - COTE J. - CRAMER N. - VAN KERKWIJK M.H. - TAYLOR A.R.: AA 290, 609 (1994)

Resolved Companions of Classical Cepheids
EVANS N.R. - UDALSKI A.: AJ 108, 653 (1994)

The Theoretical Polarization of Pure Scattering Axisymmetrical Circumstellar Envelopes
FOX G.K.: APJ 435, 372 (1994)

Be Stars in Young Clusters
GODERYA S.N. - SCHMIDT E.G.: APJ 426, 159 (1994)

Detection of Accreting Circumstellar Gas around Weak Emission-Line Herbig Ae/Be Stars
GRADY C.A. - PEREZ M.R. - THE P.S.: ASS 212, 107 (1994)

Observations of Rapid Variation of the Be Star γ Cas in 1992
GUO X.: PPMO 13, 69 (1994)

Near-Infrared Photometry for the Be Star MX Per
GUO X. - WANG J.: IBVS No. 4034 (1994)

Rapid Spectral Variations of the Be Star γ Cas
GUO X. - WANG J. - JIANG S.: IBVS No. 4035 (1994)

A Spectroscopic Study of the Be Star ζ Tau (Abstract)
GUO X.: PPMO 13, 67 (1994)

Rapid Periodic Light Variations of EM Cep
HANG H. - CHEN Y. - ZANG Z. - HUANG L. - GUO Z. - HAO J.: AAS 35, 156 (1994)

Rapid Light Variations of the Be Star LQ And and EM Cep (Abstract)
HANG H. - CHEN Y. - ZANG Z. - HUANG L. - GUO Z. - HAO J.: PPMO 13, 76 (1994)

Activity in *o* Andromedae
HARMANEC P.: IAUC 6082 (1994)

Observational Evidence for Global Oscillations in Be Star Disks
HANUSCHIK R.W.: ASS 216, 99 (1994)

On the Strategy of Future Observations and Modelling of the β Lyrae System
HUBENY I. - HARMANEC P. - SHORE S.N.: AA 289, 411 (1994)

Line Formation in Be Star Envelopes I. Inhomogeneous Density Distributions
HUMMEL W.: AA 289, 458 (1994)

3-D Radiative Line Transfer for Be Star Envelopes
HUMMEL W.: ASS 216, 87 (1994)

Metal Abundances of Magellanic Cloud Clusters
JASMIEWICZ G. - THEVENIN F.: AA 282, 717 (1994)

Comparison of New Experimental and Astrophysical f-Values for some Ru II Lines, Observed in HST Spectra of χ Lupi
JOHANSSON S.G. - JOUEIZADEH A. - LITZEN U. - LARSSON J. - PERSSON A. - WAHLSTROM C.G. - SVANBERG S. - LECKRONE D.S. - WAHLGREN G.M.: APJ 421, 809 (1994)

Correlated Long-Term Light, Colour and Spectral Variations of the Be Star κ Draconis
JUZA K. - HARMANEC P. - BOZIC H. - PAVLOVSKI K. - ZINOVSKY J. - TARASOV A.E. - HORN J. - KOUBSKY P.: AASS 107, 403 (1994)

Optical and UV Spectroscopy towards Stars in the Direction of the Cohen High-Velocity H I Stream
KEMP S.N. - BATES B. - DUFTON P.L. - KEENAN F.P. - MONTGOMERY A.S.: MNRAS 270, 597 (1994)

Chemical Abundances in Early B Type Stars. V. Metal Abundances and LTE-NLTE Comparison
KILIAN J.: AA 282, 867 (1994)

The Galactic Distribution of Chemical Elements as Derived from B Stars in Open Clusters. I. NGC 6231 - Stellar Parameters and Chemical Abundances
KILIAN J. - MONTENBRUCK O. - NISSEN P.E.: AA 284, 437 (1994)

Effects of Stromgren Spheres on the Line Formation in ζ Aur Systems
KIM K.M.: ASS 215, 167 (1994)

X-Ray Emission of the Pulsar-Be Star Binary PSR-1259-63
KING A. - COMINSKY L.: APJ 435, 411 (1994)

Spherically Symmetrical Model Atmospheres using Approximate Lambda Operators. I. First Results for Static NLTE Atmospheres
KUBAT J.: AA 287, 179 (1994)

Detection of "Moving Bumps" for the Be Star η Centauri
LEISTER N.V.- JANOT-PACHECO E. - HUBERT A.M. - FLOQUET M. - HUBERT H. - BRIOT D.: AA 287,789 (1994)

A Model of the Source LSI +61°-303
LIPUNOV V.M. - NAZIN S.N.: AA 289, 822 (1994)

β^1 Monocerotis: Oscillations and Chromospheric Structure
MARANON DI LEO C. - COLOMBO E. - RINGUELET A.E.: AA 286, 160 (1994)

Multicolor Polarimetry of Selected Be Stars - 1990-93
McDAVID D.: PASP 106, 949 (1994)

Serendipitous EUV Sources Detected during the First Year of the Extreme Ultraviolet Explorer Right-Angel Program
McDONALD K. - CRAIG N. - SIRK M.M. - DRAKE J.J. - FRUSCIONE A. - VALLERGA J.V. - MALINA R.F.: AJ 108, 1843 (1994)

On the Rotation Properties of Be Stars and their Envelopes
MENNICKENT R. E. - VOGT N. - BARRERA L. H. - COVARRUBIAS R. - RAMIREZ A.: AASS 106, 427 (1994)

PG 2120+062 - An Apparently Normal O-Star at High Galactic Latitude
MOEHLER S. - HEBER U. - DREIZLER S.: AA 282, L29 (1994)

Voyager Observations of Dust Scattering Near the Coalsack Nebula
MURTHY J. - HENRY R.C. - HOLBERG J.B.: APJ 428, 233 (1994)

Spectroscopic Analyses of the Bright Standard Star γ Geminorum (A0IV) in the Near-UV and Visible Regions
NISHIMURA M. - SADAKANE K.: PASJ 46, 349 (1994)

HD 37151 - A New Slowly Pulsating B Star
NORTH P. - PALTANI S.: AA 288, 155 (1994)

The Nature of the F str λ 4077 Stars. III. Spectroscopy of the Barium Dwarfs and other CP Stars
NORTH P. - BERTHET S. - LANZ T.: AA 281, 775 (1994)

Molecular Line Observations of a Comet-Shaped Cloud (LBN-437) in the Lacerta OB1 Association
OLANO C.A. - WALMSLEY C.M. - WILSON T.L.: AA 290, 235 (1994)

Two Dimensional Hydrodynamical Simulations of Wind-Compressed Disks around Rapidly Rotating B Stars
OWOCKI S.P. - CRANMER S.R. - BLONDIN J.M.: APJ 424, 887 (1994)

Photometric and Hα Observations of LSI+61°-303: Detection of a $\sim$26 Day V-Band and JHK-Band Modulation
PAREDES J.M. - MARZIANI P. - MARTI J. - FABREGAT J. - COE M.J. - EVERALL C. - FIGUERAS F. - JORDI C. - NORTON A.J. - PRINCE T. - REGLERO V. - ROCHE P. - TORRA J. - UNGER S.F. ZAMANOV R.: AA 288, 519 (1994)

Radiatively Driven Winds using Lagrangian Hydrodynamics
PORTER J.M.: ASS 216, 93 (1994)

Atmospheric Parameters of Field Subdwarf B Stars
SAFFER R.A. - BERGERON P. - KOESTER D. - LIEBERT J.: APJ 432, 351 (1994)

The Interior Structure and Evolution of Blue Straggler Stars in Open Clusters
SCHONBERNER D. - NAPIWOTZKI R.: AA 282, 106 (1994)

Ultraviolet Spectral Classification and Stellar Winds in a Sample of Be and Standard Stars
SLETTEBAK A.: APJS 94, 163 (1994)

Dynamic Processes in Be Star Atmospheres II. He I 2P-nD Line Formation in λ Eridani (Outburst)
SMITH M.A. - HUBENY I. - LANZ T. - MEYLAN T.: APJ 432, 392 (1994)

An Einstein Survey of the 1 Kev Soft X-Ray Background in the Galactic Plane
STANFORD J.M. - CAILLAULT J.P.: APJ 424, 671 (1994)

A New Strong Emission Episode of Lambda Eri
STEFL S.: IAUC 6098 (1994)

Simultaneous photometric and spectroscopic monitoring of rapid variations of the Be star η Cen
STEFL S. - BAADE D. - HARMANEC P. - BALONA L. A.: preprint (1994)

Fe II Line Emission from Be Stars
TARAFDAR S.P. - APPARAO K.M.V.: AA 290, 159 (1994)

Regimes of High-Energy Shock Emission from the Be Star Pulsar System PSR 1259-63
TAVANI M. - ARONS J. - KASPI V.M.: APJ 433, L37 (1994)

Observational Evidence for a Prograde One-Armed Density Structure in the Equatorial Disc of a Be Star
TELTING J.H. - HEEMSKERK M.H.M. - HENRICHS H.F. - SAVONIJE G.J.: AA 288, 558 (1994)

UVBY-β Photometry of Orion Population Stars and Related Objects Associated with Six Star Forming Regions
TERRANEGRA L. - CHAVARRIAK C. - DIAZ S. - GONZALEZPATINO D.: AASS 104, 557 (1994)

HST-GHRS Observations of β Pictoris: Additional Evidence for Infalling Comets
VIDAL-MADJAR A. - LAGRANGE-HENRI A.M. - FELDMAN P.D. - BEUST H. - LISSAUER J.J. - DELEUIL M. - FERLET R. - GRY C. - HOBBS L.M. - McGRATH M.A. - McPHATE J.B. - MOO S.H.W.: AA 290, 245 (1994)

Intrinsic Color Indexes of OB Supergiants, Giants, and Dwarfs in the UBVRIJHKLM System
WEGNER W.: MNRAS 270, 229 (1994)

Classical H II Regions in the Magellanic Clouds. II. Stellar Content
WILCOTS E.M.: AJ 108, 1674 (1994)

Abbreviations used for the Publications

AA	Astronomy and Astrophysics
AASS	Astronomy and Astrophysics Supplement Series
AAS	Acta Astronomica Sinica
AAPS	Acta Astrophysica Sinica
AJ	Astronomical Journal
APJ	Astrophysical Journal
APJS	Astrophysical Journal Supplement
ASS	Astrophysics and Space Science
BAAS	Bulletin of the American Astronomical Society
BAC	Bulletin of the Astronomical Institutes of Czechoslovakia
IAUC	IAU Circular
IBVS	Information Bulletin on Variable Stars
MNRAS	Monthly Notices of the Royal Astronomical Society
PASJ	Publications of the Astronomical Society of Japan
PASP	Publications of the Astronomical Society of the Pacific
PBAO	Publications of the Beijing Astronomical Observatory
PPMO	Publications of the Purple Mountain Observatory
SSR	Space Science Reviews
RMAA	Revista Mexicana de Astronomia y Astrofisica

7. MEETINGS

7.1. IAU Symp. 176: STELLAR SURFACE STRUCTURE

Vienna, Austria, 9 - 13 October 1995

The Institute for Astronomy of the University of Vienna is pleased to announce that they will be hosting the 176th IAU Symposium on "Stellar Surface Structure" in 1995. The meeting will be held at the Festsaal of the University's main building in downtown Vienna from Monday the 9th to Friday the 13th of October 1995.

The Symposium will include sessions on indirect stellar surface mapping techniques, so-called Doppler imaging or Doppler tomography, as well as multiwavelength observations of a large variety of stellar surface structure and stellar analogs of solar phenomena. The appearance of chromospheric and transition-region features and the coronal structure of stars throughout a large fraction of the H-R diagram including the Sun will be reviewed in the light of the success of recent space missions and new theoretical models. Attention will also be focused on the spatial connection between magnetic surface activity and velocity fields at different atmospheric layers. The influence of RS CVn-type activity on the three-dimensional structure of stellar atmospheres will be addressed from an observational and a theoretical viewpoint. This should pave the way to next-generation model atmospheres. Observational results from the mapping of starspots, chemical inhomogeneities of Ap-star surfaces, the application of Doppler imaging techniques to O and Ae/Be stars, coronal X-ray mapping, and the technique of emission-line mapping and its application to white dwarfs, accretion disks of dwarf novae and Algols as well as stellar chromospheres will be presented. Also, we will have a special session on high-resolution direct imaging of stellar surfaces by means of interferometric techniques, and on current programs to monitor solar and stellar activity including recent advances with space missions and with small ground-based robotic telescopes.

A list of invited speakers will be presented in the second announce- ment and we already invite all those interested to contribute papers. Although only some of the contributed papers will be selected by the SOC for oral presentation, ample time will be made available for the display and discussion of poster papers. Each daily session is planned to be followed by an oral poster presentation in which the authors give a brief overview of their work.

If you are interested in receiving additional information about IAU Symposium No. 176, please direct inquiries to

`iau@astro.ast.univie.ac.at`

as soon as possible. This and upcoming information can also be retrieved via anonymous ftp from

`venus.ast.univie.ac.at (131.130.36.33)`

under directory `pub/kgs/iau`. On line registration has been set up via World Wide Web through Mosaic under URL

`http://venus.ast.univie.ac.at`

Klaus G. Strassmeier and Jeffrey L. Linsky

7.2. Vienna International Workshop on MODEL ATMOSPHERES AND SPECTRUM SYNTHESIS

for mid B through mid G Stars, at or Close to the Main Sequence

- Time: July 6, 1995 (Thursday) through July 8, 1995, with possible additional days July 10, and 11, 1995 (Monday and Tuesday)
- Location: Vienna, Technical University, Demonstration Hall of the Computing Center of the TU-Vienna. The TU is located close to the Opera house, at 'Karlsplatz', within 15 minutes walking distance from the very center of the town (St. Stephans Cathedral). The Demonstration Hall is in the last (6th) floor of the TU building in the 'Gusshausstrasse' (5 walking minutes from the main TU building) with a nice view over Vienna, and provides us with probably most of the computing facilities we will be needing (workstations, network, coffee, overhead projectors, laser-printer, etc.). If specific computing devices (hard/software) will be needed by a participant, the organizers need to know this not later than by February 1995, otherwise (s)he has to live with what we offer.
- Purpose of the workshop: To coordinate research activities related to model atmosphere codes and auxiliary programs, especially spectrum synthesis and opacities, including atomic and molecular data handling and distribution. Confrontation of theory with observations.
- Preregistration: If you are interested in receiving further information on this workshop, please send a message to internet:
  `kupka@galileo.ast.univie.ac.at`
  If possible, please avoid communication via: FAX +43-1-47068007, or regular mail: Workshop, c/o Institute for Astronomy, Tuerkenschanzstr.17, A-1180 Wien/Vienna, Austria
- Format of the workshop: The focus of this workshop will be on actually working in small groups with workstations. The schedule therefore cannot be as rigid as for a typical, even small conference. It is planned to arrange for one to three reviewing presentations and round-table discussions per day on key-issues. Depending on the response to this first call, the incoming suggestions of the participants and the structure of the workshop, we are planning to produce at least a scientific report or possibly proceedings.

Saul J. Adelman and Friedrich Kupka

7.3. Radio Emission from the Stars and the Sun

University of Barcelona (Barcelona, Spain) – July 3 - 7, 1995

The main topics of the meeting will be:
Radio Emission from Circumstellar Envelopes
Novae and Cataclysmic Variables
X-ray Binaries
Supernovae
Radio Activity from Stars
The Active Sun
The Quiet Sun
The Solar-Stellar Connection

A file with an ASCII version of the First Announcement can be obtained from `fareb1.am.ub.es` (161.116.78.58) via anonymous ftp. The steps for doing this are as follows:

Type "ftp fareb1.am.ub.es"
At the "login:" prompt type "anonymous" as your username
At the "password:" prompt type your e-mail address
Type "cd pub"
Type "get announc1.txt"
Type "quit"

Contact e-mail address: `radio@mizar.am.ub.es`

Contact postal address:

General Secretariat
RADIO EMISSION FROM THE STARS AND THE SUN
Ultramar Congress
Diputacio 238, 3
E-08007 Barcelona
SPAIN

Tel.: (343) 4827140
Fax : (343) 4827158

A.R. Taylor and J.M. Paredes