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Be STAR NEWSLETTER



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Editor: Geraldine J. Peters
Space Sciences Center
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The Be Star Newsletter is open to all contributions related to matters concerning Be stars. Please send manuscripts and all correspondence to the editor's address given on the front page. In the case of very urgent late contributions directly contact the technical editor via one of the fast links listed below. The Newsletter is distributed free of charge to all astronomical institutions which request it. If you wish that the Newsletter is also received at your institute, write to the technical editor:

Dietrich Baade		Phone: +49-89-32006388
ST-ECF		Telex: 528 282 22 EO D
European Southern Observatory		Computer communication systems:
Karl-Schwarzschild-Str. 2		X25: PSI%262458900924:: [DIETRICH]
D-8046 Garching		SPAN: ESOMC1::DIETRICH
W. Germany		Bitnet/EARN: DIETRICH@DGAES051

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Acknowledgements: The Be Star Newsletter is produced at and financially supported by ESO and the ST-ECF. Britt Sjöberg and Harry Neumann are thanked for their active help in administrative and technical matters. The graphic on the front page is by Christa Jauch.

EDITORIAL

* * * * *

I would like to wish you a somewhat belated Happy New Year and extend my hope that 1988 brings you happiness, success, and many breakthroughs in our perennial quest to understand the Be stars. This seventeenth issue of the *Be Star Newsletter* contains the familiar Contributions, Working Group Matters, What's Active/Inactive?, Observations....Theoretical Support Wanted/Available, Preprints Received, Bibliography, and Meetings of interest to the Be star community. Again, I thank all the researchers who contributed to this issue and am especially indebted to those who helped with bibliography. If a recent paper of your's is not listed (or cited incorrectly), I will mention it in the next issue if you call my attention to the oversight. I continue to appreciate your comments on the *Newsletter* and strive to make it as useful as possible to the readership.

In November, I learned of the recent untimely death of Dr. Gao Weishi, who contributed two articles on ζ Tauri for the last issue of the *Newsletter*. We extend our condolences to his family and will certainly miss him in the Be star community. An obituary for Dr. Gao is included in this issue.

Impressive short-term activity continues to be observed in Be stars. In this issue striking spectroscopic or photometric variations are reported in HR 2855 (FY CMa), HR 4123, λ Eri, and ω Ori. In addition, descriptions of two catalogues which might be of interest to the Be star community are included.

I am looking forward to seeing you at the 20th IAU General Assembly to be held in Baltimore August 2 - 11 and perhaps at the IAU Colloquium on Algols afterwards. We plan to publish a special issue of the *Be Star Newsletter* just before the general assembly. If you would like to contribute an article or abstract, please send me the material by:

June 1, 1988

We will make the decision about the publication date for issue No. 19 during the meeting in Baltimore. I continue to get the impression that our present biannual distribution is generally favored.

I thank the Space Telescope - European Coordinating Facility and the European Southern Observatory for their continued financial support.

Gerrie Peters, Editor

WORKING GROUP MATTERS

The most important upcoming event for the Working Group as a whole is the IAU General Assembly taking place in Baltimore this August. It now seems confirmed that we will have a meeting of 2×1.5 hours. In view of the short time, the Organizing Committee has decided that there will be no contributed papers, but that the emphasis of the scientific part (*i.e.*, most of) of the meeting will be on discussion in order to enable the broadest possible active participation.

For the proper understanding of Be stars correlations between various quantities or processes probably play a key role. In spite of their importance not all of them are evident to everyone, and if this is so only because in some cases not everyone can readily access the relevant databases. Since other suggestions have not been received, the general subject of the meeting will therefore be to give a condensed overview of as many of these correlations as time permits. The aim is to exclusively concentrate on the bare facts as we believe to know them today. In order not to obliterate what we are actually seeing by what we think it means, the interpretation of the observations in terms of *any* model will be suppressed to the fullest possible extent. The Organizing Committee will for each sub-subject ask one colleague not only to summarize the state of our knowledge but also to give a solid demonstration of the observations that give rise to the claim of a correlation between two (or more) empirical parameters. As Gerrie Peters has announced in the Editorial, details of the Working Group meeting will be communicated to you in a special issue of the Newsletter.

In Baltimore, it will also be time to elect a new Organizing Committee. However, not all of you will be able to attend, so that a ballot form is reproduced also on the next page. Please use this form only if you will not attend the Working Group meeting during the General Assembly. The Organizing Committee has decided not to demand any formal legitimation from the participants in the ballot. The argument that has finally won me over was that any restriction might work strongest against young colleagues and other newcomers who chose to Be. We follow the same procedure as in the past in that you are asked to provide seven names of colleagues working in the field of Be stars who as a group, in your opinion, represent the Be star community best. The idea of this procedure is that if everyone proposes a group, the seven persons, that have been named most often and will therefore form the new Organizing Committee, are not too random a collection of otherwise very suitable individuals. If you permit me to do so, I would like to suggest that you consider a broad range of minorities (I anyway don't see a majority) and do not forget that regularly changing the 'apparatchiks' is a very healthy fundamental principle. Before casting your vote, it might also be useful to spend a few thoughts on (i) why a working group Be stars should exist and (ii) what you could contribute to achieving these goals.

My proposal made in the last issue of the Newsletter to install an electronic mail box for Be star matters found a rather small response. By adding a couple of addresses that I knew already, I succeeded in compiling an electronic mailing list with 20 names on it. All colleagues on that list should have received a copy. Additions and updates are possible at any time. Because of the apparently relatively low interest and some minor technical problems on the ESO computers, I shall not for the time being create that mail box. But you are always welcome to send me urgent messages which I would then try to forward to all other group members concerned.

Dietrich Baade

Please do not tear out this page - other working group members reading this issue may also wish to participate in the ballot. Therefore (only if you will not be able to attend the General Assembly) kindly photocopy this page, fill in up to seven names (in any order) and mail to:

Dr. Arne Slettebak
Perkins Observatory
Ohio State University
P.O. Box 449
Delaware, Ohio 43015
USA

To be sure that your votes can have an effect, please take care that your mail reaches its destiny well in advance of the IAU General Assembly, i.e., before mid-July.

.....

I propose the following colleagues as members of the Organizing Committee of the Working Group Be Stars for the period 1988-1991:

- _____
- _____
- _____
- _____
- _____
- _____
- _____

O B I T U A R Y

* * * * *

Gao Weishi (1940 - 1987)

Gao Weishi was born on 1940 October 28 in a village near Kunshan County, Jiangsu Province, China. After studying as a student in the astrogeodesy department at the Wuhan Institute of Geodesy, Photogrammetry and Cartography for the first three years, 1957-1960, he was transferred along with many others to enter a two-year Training Course in Astrophysics (TCA) in Beijing co-sponsored by the University of Science and Technology of China and the Beijing Astronomical Observatory (BAO). In 1962 October he joined the staff of the BAO, having been graduated from the TCA with a thesis entitled "A study of stellar continuous spectra".

In 1963-64 Gao took part in a large-scale site survey observing campaign that led to the selection of Xinglong as the optical outstation of the BAO. In 1965-68 he and many other young colleagues served as technical/financial/administrative personnel supervising the construction of roads, buildings, telescope domes, and all other facilities needed for the Xinglong observing station.

China has long been plagued by the lack of powerful instrumentation in observational astrophysics in general, and in stellar spectroscopy in particular. Gao Weishi, starting his career in stellar spectroscopy at an early age and becoming in the later years increasingly aware of the difficult situation he was to face, was never deterred by the adverse circumstances. His interest in the spectroscopic studies of stars lasted throughout his scientific life covering symbiotic stars, spectral classification, Be, shell and binary stars. He was not only an ardent observer of slit stellar spectra alternating between the Xinglong and Kunming telescopes, but also showed unusual talent and thoroughness in making technical tests of the optical performance of the Xinglong Schmidt telescope and the coordinate-measuring machine. He participated in the adjustment of the Schmidt telescope slit spectrograph with great care and was capable of assuming the responsibility to carry forward the spectrograph project for the planned 2.16m telescope when the senior astronomer in charge of the project was away from China.

For years Gao was in charge of the spectroscopic subgroup of the Be & shell star team. He led all members of the subgroup in making a great deal of observations and analyses. He devoted himself to the spectroscopic study of Be and shell stars, and especially several famous bright ones, for which he and coworkers had got a long continuous series of valuable material. He is the senior author of a paper "On the rotation of 53 Be stars" published in 1986. His hard work had

substantially contributed to the progress of Be star spectroscopy at our observatory. He led an 8-year observing programme of ζ Tauri resulting in the detection of long-term shell activities in this star which was summarized in the paper "The visual spectrum of ζ Tau in 1979-1985".

For the Astronomy volume of the Greater Encyclopedia of China published in 1980 he had written the entries Be stars, Shell stars, Spectrum variables, and Stellar rotation.

By joining two colleagues who until that time have been engaged in eclipsing binary photometry Gao Weishi did play a key role in creating a group at the Beijing Observatory trying to make radial velocity observations from China and possibly improve the orbits for some bright spectroscopic binaries in collaboration with the Yunnan Observatory. Year after year Gao had devoted much time observing with the 1m telescope coude spectrograph at the Yunnan Observatory in Kunming, measuring the plates for radial velocity on the PDS microdensitometer at the Purple Mountain Observatory in Nanjing, and analysing data with coworkers. His persistent enthusiasm and outstanding skill has contributed greatly to the smooth progress of this emerging experimental project. Consulting the spectrophotometric line identification charts compiled by him his coworkers appreciate time and again his utmost care and patience characteristic of his devotion to the cause of stellar physics throughout his career.

The tragic death of Gao Weishi in a traffic accident in 1987 October shocked and saddened all his collaborators and friends. His coming to an untimely end has deprived China of one of her few dedicated stellar spectroscopists. It has been a heavy blow to both the Be star team and the experimental radial velocity group. To his coworkers in the radial velocity effort his completely unexpected passing was the sudden parting for ever of a friend in need. He will be long missed by the coworkers and remembered by many who had been so kindly helped by him through the years. To his wife Zhang Jiali and son, Gao Wei, we extend our deep sympathy and condolence.

Cao Huilai and Shen Liangzhao

* * * * *

UV Monitoring of Bright Be Stars

C. A. Grady

Astronomy Programs, Computer Sciences Corporation

IUE observations of a group of bright Be stars have been continuing with approximately 4 hours of IUE high radiation time each month. We have been following γ Cas, λ Eri, HD 58978 (FY CMa or HR 2855), 6 Cep, and 59 Cygni recently. IUE observations for this program are scheduled for March 20 (VILSPA), April 10, and May 11, 1988. Observations will continue through the eleventh episode (beginning June 1988).

λ Eri: High velocity discrete absorption components have been present in all IUE spectra obtained from 1987 September through 1988 February 14.

γ Cas: IUE spectra obtained from 1987 September through 1988 February 14 show high velocity discrete components in C IV, Si IV, and N V.

HD 58978: Strong, and dramatically variable wind absorption continues to be seen in the resonance profiles of N V, Si IV, and C IV. The 1988 February 14 observation showed the strongest N V emission detected to date, 1.45 times the continuum flux. Low ionization infall in the range +50 to +100 km/s continues to be seen in S III, Si III, Al III, Fe III, and C II. Two spectra obtained within the past year, SWP 30392 (1987 February 25), and SWP 32317 (1987 Nov. 14) show infall in N V, Si IV, and C IV, but not in the less highly ionized species. Infalling material observed in the 1987 February spectrum reached +350 km/s. Observations of this star are being coordinated with program BEJGP to determine whether the ionization variation in the infalling material is periodic. Since Peters (1988) has shown that infall signatures can be seen in the optical spectrum of this star, our understanding of this target may benefit considerably from additional ground-based monitoring.

6 Cep: High velocity discrete absorption components are present in all of the IUE spectra obtained during this observing season.

59 Cyg: The wind in this star continues to be strong. Observations were not possible in 1988 February, due to the IUE solar avoidance constraints. Observations will resume in 1988 March.

Peters, G.J. 1988, *Ap.J. (Letters)*, in press.

Spectroscopic Observations of an Episodic Outburst in the Be star HR 4123

K. K. Ghosh

Indian Institute of Astrophysics, Vainu Bappu Observatory,
Kavalur, Alangayam, N. A. , T. N. 635701, India

In the course of a search for long-term spectral variations in Be stars it was found that HR 4123 displayed what might be described as an episodic outburst phenomena. Five spectra in the H_{α} region were obtained for this star between April 30, 1987 and January 02, 1988. Final reductions of the photographic spectrograms were done using RESPECT software (Prabhu et al. 1987). Spectra of HR 4123 are shown in Fig. 1. From our observations the following results have been obtained :

1. H_{α} profile consists of two emission components at the center of the broad stellar absorption line (see H_{α} profiles of Fig. 1 except for May 11, 1987). No stellar absorption feature is seen in the H_{α} profile of May 11.
2. Total emission strength of H_{α} line increased substantially from April 30 to May 09 and within just two days from May 09 to May 11, it increased tremendously.
3. Before the outburst (May 11), the peak separation (ΔV) of the two emission components is 4.3 \AA ; after the outburst, the ΔV^{peak} values are 3.5 \AA (07 June) and 3.96 \AA (January 02, 1988); but during the outburst there is almost no well defined red component (H_{α} profile is highly asymmetric).
4. On April 30, May 09, 1987 and January 02, 1988, the V / R ratio of the two emission components is almost equal to one. But this value is definitely greater than one on June 07.
5. Before and after the outburst, the full width at half intensity maximum of H_{α} emission line is relatively larger than during the outburst.

6. Very broad and strong emission line has been observed around 6580 \AA on May 11. This line may be most likely due to C II emission (may be the result of blending of triple structure with peaks near $\lambda\lambda 6574, 6580$ and 6586 \AA of C II). Very weak emission of this line was also is seen on May 09. This line was detected for the first time in Be stars by Baade et al. (1988) during the recent H_{α} outburst of μ Cen.

Nonradial oscillations have been discovered in some Be stars (Baade 1982 a,b, 1984; Vogt and Penrod 1983) and this has led to the suggestion that there may be a connection between these photospheric activities and the episodic outburst in Be stars (Penrod 1986, 1987). Therefore, it is important to monitor this star (HR 4123) to find out the nonradial pulsations in it. If HR 4123 turns out to be a nonradial oscillator, then it will strengthen the theory of mass loss events of Be stars driven by instabilities of the nonradial pulsation (Penrod 1986).

References:

- Baade, D. 1982a, *Astron. Astrophys.* 105, 65.
-----, 1982b, *Astron. Astrophys.* 110, L15.
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-----, 1988, *Astron. Astrophys.* (in press).
Penrod, G. D. 1986, *Publ. Astron. Soc. Pac.* 98, 35.
-----, 1987, *Physics of Be Stars*, IAU Colloqu. 92, eds. A. Slettebak and T. P. Snow, Cambridge University Press, Cambridge, P. 282.
Prabhu, T. P. et al. 1987, *Bull. Astron Soc. India*, 15, 98.
Vogt, S. S. and Penrod, G. D. 1983, *Astrophys. J.* 275, 661.

Figure Captions:

Fig. 1. Spectra of HR 4123 in the H_{α} region. Date of observations are given to the left and bias values have been mentioned to the right.

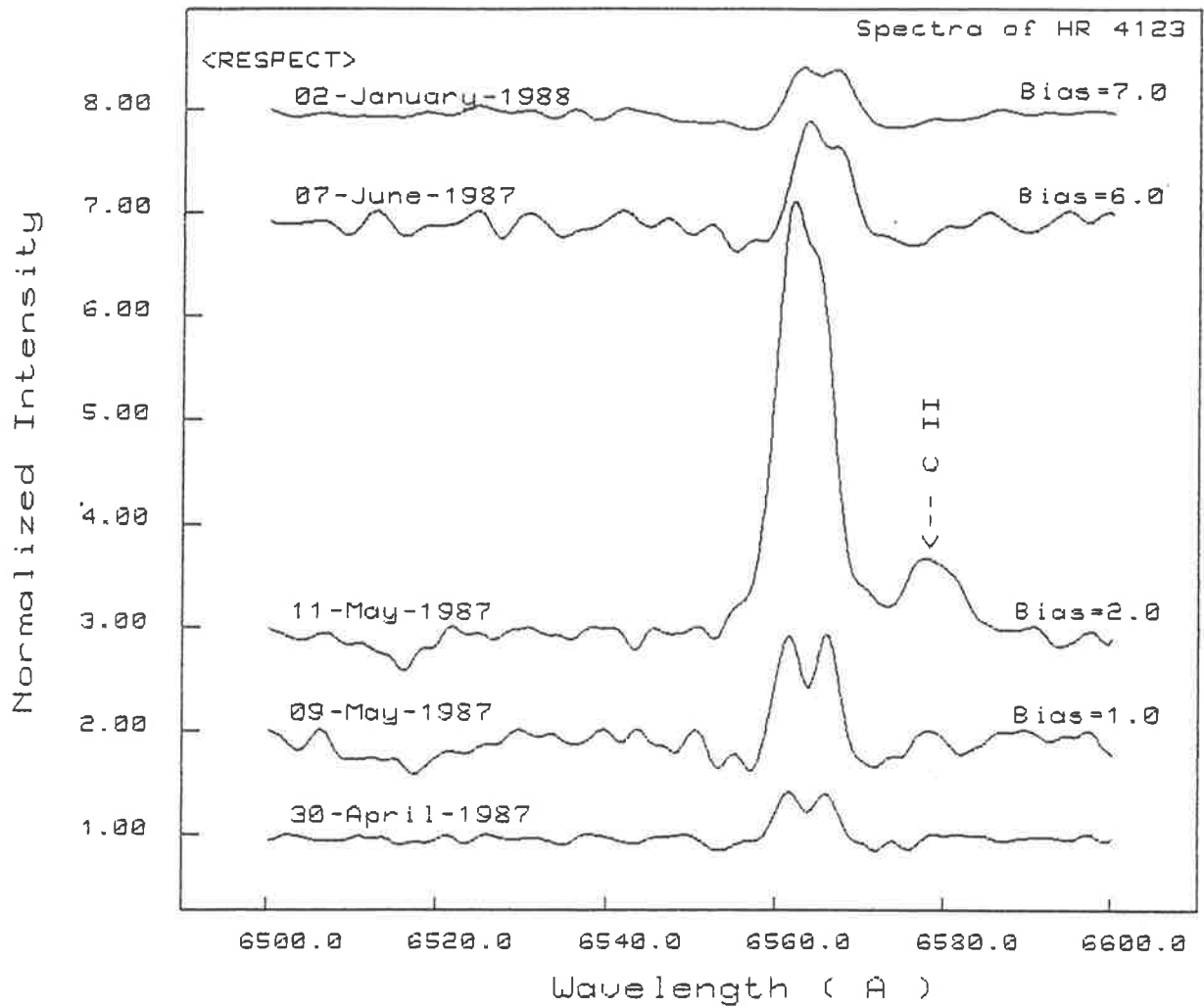


Fig. 1

ARE SOME Be STARS NONRADIAL PULSATORS?

L.A. Balona
South African Astronomical Observatory
P.O. Box 9, Observatory 7935, Cape, South Africa

The most easily observed characteristics of nonradial pulsation (NRP) are:

- (i) Periodic line profile variability;
- (ii) Multiperiodicity;
- (iii) A period too short to be explained any other way.

All these characteristics are found in β Cep and δ Sct stars; (iii) is one of the main arguments in showing that Cepheids, RR Lyraes etc. are radial pulsators. To what extent are these characteristics present in Be stars?

Line profile variability is certainly seen in many of these stars, though a period has been found in only one case (28 CMa). We exclude the "moving bump" phenomenon as it is not clear that this is necessarily connected with the Be phenomenon (it is seen in non-Be stars and even in δ Sct stars). It is in any case not connected with the short-period light variations for which NRP is often given as an explanation. Allowing for the fact that many (perhaps most) Be stars commonly display a double-wave light curve, it can safely be said that neither (ii) nor (iii) have been detected in Be stars. This does not disprove the NRP hypothesis, but the most compelling reasons for advocating this hypothesis do not exist as (i) is not unique to NRP.

In science it is always very useful to have a working hypothesis which can easily be disproved. In the present context, the assumption that the short period variations in Be stars are somehow connected with stellar rotation and that the periods are the rotational periods is one such hypothesis. If only one Be star was to be discovered to have characteristic (ii) or (iii), the whole hypothesis will be invalidated.

Can a similar statement be made for NRP? The answer seems to be no. Since any finite set of observations can always be decomposed into a multiperiodic Fourier series, it can always be interpreted in terms of NRP. Without a proper theory which predicts periods, modes and amplitudes for NRP in rotating stars, there is no means of discarding such a theory. One way of supporting this theory is to try and fit the line profile variations and to obtain the pulsation mode. This has not been done.

In my opinion it seems more profitable to concentrate on disproving the rotational modulation hypothesis. As more and more stars are found which are singly periodic with periods compatible with the expected rotational period, then one can conclude that rotational modulation is probably the correct explanation. At the same time the need for invoking NRP will disappear.

The easiest way of meeting this goal is by photometric observations. Since most stars have periods close to one day, multi-site observations are of great importance. It is also very important to have a long continuous run as one needs to separate the long-term drift associated with circumstellar material from the underlying periodic variations. To this end Jan Cuypers (Leuven) and myself have been conducting a campaign on southern Be stars. These results will, hopefully, disprove the rotational modulation theory.

Fe II REFERENCE CATALOGUE

Roberto Viotti

Istituto Astrofisica Spaziale, CNR, Via Enrico Fermi 21,
C. P. 67, I 00044 Frascati (RM), Italy

Giovanni Battista Baratta

Osservatorio Astronomico, Via del Parco Mellini 84,
I 00161 Roma, Italy

In order to give a ground for current works on the PHYSICS OF FORMATION OF LINES OF Fe II and of other similar ions in the spectra of astrophysical objects, we have prepared an extensive Catalogue of the articles published until June 1986 on the matter. The Catalogue consists of three tables with the articles arranged by alphabetical and chronological order (Table 1), by physical subject (Table 2), and by astrophysical category (Table 3). The following subjects/categories have been considered:

Subjects:

- Atomic data (levels, gf-values, collision strengths, etc.)
- Physical processes (excitation, including selective excitation processes, ionization and recombination)
- Data analysis (excitation temperature, curve of growth, self absorption curves)
- Model (theoretical models of the line formation region)
- Spectral synthesis
- Observation of Fe II, (Fe II) lines:
 - line identification
 - line intensity
 - line profiles, including broad emission
- (Fe II) absorption lines
- Other atomic species (Fe I, Fe III to Fe VII, Co, Ni, etc.)
- General (review articles, catalogues, surveys)

Astrophysical Categories:

- The Sun (photosphere, chromosphere)
- Stars, late (G-type or later, T Tau and Mira variables, etc.)
- Stars, early (F-type or earlier, Ae, Be)
- Stars, Luminous Blue Variables (LBV= P Cyg, S Dor, Hubble-Sandage variables)
- Stars, variables (binaries, symbiotic stars, VV Cep and R CrB variables, novae)
- Diffuse matter (Herbig-Haro objects, supernovae, SNR, diffuse nebulae, interstellar matter)
- Extragalactic astronomy (normal galaxies, active galactic nuclei)

The Catalogue is available as 3 computer files (card format, about 1800 records). Applications can be addressed to:
Roberto Viotti at UVSPACE @ IRMIAS at EARNET (or BITNET).

The authors would appreciate very much for any omission brought to their attention and suggestions for future editions of the Catalogue.

A New Machine-Readable Version of the *Catalogue, Spectrum and
Magnitude Data Bank of B_e, B_p and B_{pe} Stars*

Wayne H. Warren Jr.
Astronomical Data Center (ADC)
National Space Science Data Center
NASA Goddard Space Flight Center

In 1981, Arthur A. Page of the Mt. Tamborine Observatory in Aspley, Australia, published a large compilation of data on B_e stars (Page 1981). A machine-readable version of this catalog, prepared in collaboration with Kenneth D. Jackson of the University of Queensland, contained an extensive introduction, a table of some 4000 B_e, B_p and B_{pe} stars listed in bibliographic references up to a cut off date of 31 December 1980, a large list of about 1400 references to the literature dating from the early nineteenth century through 1980, approximately 15,000 spectral classifications and magnitudes for stars in the catalog, and an extensive cross index for identification of the stars in various published catalogs and papers.

The compilation was expanded in 1984 with the addition of a large number of primary and secondary references, with a subsequent increase in volume of about 30 percent, although with the exception of the addition of information from the catalog of Uesugi and Fukuda (1982), the cut off date remained the same. The new compilation was supplied to the ADC on magnetic tape by Colonel Page in 1986 April. Considerable effort was required to read and process the data properly because the tape files had been created by system utilities that produced data blocks of variable length and unusual blank fill; thus, the machine-readable version required much time to transfer from the tape and to prepare for archiving and general distribution in a form that ensures the data to be easily processable at any computer facility.

The present machine version (catalog #3110 in the ADC *Status Report on Machine-Readable Catalogs*) consists of a print file containing carriage control characters, a uniformly formatted coded data file, and a file of references. The print file enables a complete printed version to be produced with a simple reading and writing program. The only internal changes made at the ADC were to this file, where a few non-standard hexadecimal codes employed in the original data were changed to codes representing characters more commonly used in the ASCII and EBCDIC character sets. The entire catalog occupies about 3.5 Mbytes of storage and can be easily transported on a single reel of magnetic tape at 1600 or 6250 bpi. It is, however, too large for transmission over the networks.

The machine-readable version of the B_e catalog may be obtained from the ADC by sending a blank (preferably new) 732-m (2400') magnetic tape and a letter briefly describing what the data will be used for and how the tape should be written (density, character coding [ASCII, EBCDIC], maximum allowable block size [physical record length], and type of computer to be used to process the tape). (Alternatively, an ADC request form from the latest issue of the *Astronomical Data Center Bulletin* can be used alone, since the form contains all of the information needed to prepare the tape.) All requests should be sent to the author at the following address: Astronomical Data Center, National Space Science Data Center, Code 633, NASA Goddard Space Flight Center, Greenbelt, MD 20771, U.S.A.

REFERENCES

Page, A. A. 1981, *Publ. Mt. Tamborine Obs.* No. 2.

Uesugi, A. and Fukuda, I. 1982, *Revised Catalogue of Stellar Rotational Velocities*, Department of Astronomy, Kyoto University.

WHAT ' S A C T I V E / I N A C T I V E ?

* * * * *

During early November, 1987 coordinated multifrequency observations of ω Ori and λ Eri were successfully carried through using the *IUE* and *Voyager* spacecrafts and numerous ground-based telescopes (cf. *Be Star Newsletter*, Issue No. 16 for additional details). Forty continuous hours of repeated *IUE* observations were obtained on November 5 and 6 as well as a few exposures on November 4 and 7. Both stars displayed interesting activity during the observing campaign thus disproving the inwardly acknowledged maxim for Be star observers: "A watched star never performs"!

* * * * *

Myron Smith, NOAO/NSO, has observed the following activity in λ Eri during late 1987 - early 1988. The observations were made with the TI4 CCD and the McMath Telescope at KPNO and included He I 6678 and H α . Highly variable (weak) emission was observed in H α and the He I line. A few transient events similar to those seen in μ Cen in 1985 (cf. Peters, G. J. 1986, *Ap. J.* 301, L61) were observed in He I 6678. A sequence of profile variations in λ 6678 suggest an ejection of superheated material, subsequent electron scattering in the circumstellar material, and the apparent return of the ejected material to the photosphere. In late 1988 January, when the veiling had subsided to the extent that one could again observe the star's photosphere, the $l = 8$ travelling bumps were clearly visible, but temporarily blurred out during a transient event. This striking activity will be fully described in a forthcoming paper, which is in preparation.

* * * * *

Edward F. Guinan, Astronomy Department, Villanova University, reports that ω Ori underwent an outburst a few days prior to 1987 October 25. Brightness increases of 0^m34, 0^m28, and 0^m20 were observed in the red (6600 Å), yellow (5470 Å), and blue (4530 Å) filters, respectively. The rise to maximum brightness was broad and peaked in early December. Recent photometry suggests that the H α emission is currently increasing in strength. Such behavior has been observed previously in this star which undergoes this type of outburst quasi-periodically every 6 - 11 months.

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OBSERVATIONS...THEORETICAL SUPPORT...WANTED/AVAILABLE

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UV MONITORING OF BRIGHT Be STARS

C. A. Grady and H. F. Henrichs

This program, which was described in Issue No. 16 of the *Be Star Newsletter*, will continue during the eleventh year of the IUE Guest Investigator program (1988 June - 1989 May). Five US2 and one VILSPA shifts were awarded for the eleventh episode, so the previous coverage of 4 hours/month will continue through 1989 May. The target list includes γ Cas, δ Cen, ζ Oph, 2 Vul, σ And, 59 Cyg, 66 Oph, 6 Cep, λ Eri, HR 2855 (FY CMa), 25 Ori, ω Ori, 19 Mon, α Col, and ψ Per. For additional information on the project and requests to add targets, telephone Carol Grady at (301) 286-3938 from 9 A.M. to 5 P.M. (EST) or write to her at the IUE Observatory, Code 684.9, NASA/Goddard Space Flight Center, Greenbelt, MD 20771.

* * * * *

PRELIMINARY ANNOUNCEMENT OF A POSSIBLE CAMPAIGN ON RAPIDLY VARIABLE Be-SHELL STARS

G. J. Peters and J. R. Percy

Following the success of our coordinated multifrequency observations of σ And, λ Eri, and ω Ori in 1987 (cf. *Be Star Newsletter*, Nos. 15 and 16), we are attempting to organize a similar campaign on *Be-shell* stars that display rapid photometric variability in the optical region. The probable targets are ϵ Cap, EW Lac, and σ Aqr. There is also some interest at this time in 28 Cyg, although it does not currently show a prominent shell. The dates that are currently favored for the campaign are late August - early September 1988 but we are receptive to other suggestions. Many of the same investigators who contributed to the 1987 campaign will also be involved in this one. If you are interested in participating in this campaign, 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, Calif. 90089-1341; USA (spectroscopic observations).

* * * * *

I am interested in any information on the strength and profile of the H α emission line in 66 Oph and HR 2855 (FY CMa) during the past twenty years. I would also appreciate any photometric data that are available.

Gerrie Peters (address given above)

* * * * *

P R E P R I N T S R E C E I V E D

* * * * *

Line Profile Variations in Be Stars

APPARAO M.V. - TARAFDAR S.P.; Tata Institute of Fundamental Research; Homi Bhabha Road; Bombay 400005; India

Preprints: M. V. Apparao at above address.

Abstract: Be stars show both emission and absorption profiles in the optical and these are found to vary. Some of the shifts in profiles were earlier interpreted as Doppler shifts. It is shown here that some of the shifts may not be Doppler shifts, but can be artifacts due to the combination of an emission profile due to a compact star in binary motion around the Be star, and the emission or absorption profile due to the Be star.

Rapid H α Variability in ϕ Per

GHOSH K.K. - SANJEEVKUMAR T. - JAYAKUMAR K. - KUPPUSWAMY K. - ROSARIO M. J.; Indian Institute of Astrophysics, Vainu Bappu Observatory; Kavalur, Alangayam, N.A.; T. N. 635701; India

Submitted to: *Publ. Astronomical Society of the Pacific*

Preprints: K. K. Ghosh at the above address.

Abstract: A search of rapid variability of H α with the time resolution from 30 to 45 seconds is performed for ϕ Per. In total 42 spectra in H α were obtained during three nights. Our results show the presence of rapid irregular variability (time scale of few minutes) of the equivalent width of the H α line in ϕ Per.

Rapid Simultaneous Observations of Fe II and Balmer Emission Lines of χ Oph

GHOSH K.K. - JAYAKUMAR K.; Indian Institute of Astrophysics, Vainu Bappu Observatory; Kavalur, Alangayam, N.A.; T. N. 635701; India

To be published in: *Astrophysics and Space Science*

Preprints: K. K. Ghosh at the above address.

Abstract: Sudden brightening of Fe II and Balmer (H β and H α) lines of χ Oph was observed on 28/29 May 1986. Equivalent width of Fe II and H β lines increased by a factor of two and that for the H α line by a factor of four, during the brightening phase of the star. Balmer line profiles suggest that strong radial motions or turbulence or both are present in the dusty envelope of χ Oph. Finally, this brightening phenomenon has been explained in the frame work of "Coronal Radiative Instability".

Introductory Comments to the Panel Discussion on Discrimination between Various Possible Causes of Rapid Variability in Stars

HARMANEC P.; Astronomical Institute, Czechoslovak Academy of Sciences; 251 65 Ondrejov; Czechoslovakia.

To be published in: Proc. Tenth European IAU Meeting, Vol. 5 (ed. P. Harmanec), Publ. Astron. Inst. Czech. Acad. Sci. No. 70.

Preprints: P. Harmanec at the above address.

Is Omicron Andromedae a Quadruple or Even Quintuple System?

HARMANEC P. - HILL G.M. - WALKER G.A.H. - DINSHAW N. - YANG S.; Astronomical Institute, Czechoslovak Academy of Sciences; 251 65 Ondrejov; Czechoslovakia; and Geophysics and Astronomy Department, University of British Columbia; Vancouver, B. C. V6T 1W5; Canada

To be published in: Proc. Tenth European IAU Meeting, Vol. 5 (ed. P. Harmanec), Publ. Astron. Inst. Czech. Acad. Sci. No. 70.

Preprints: P. Harmanec at the first address.

Omicron Andromedae is Quadruple

HILL G.M. - WALKER G.A.H. - DINSHAW N. - YANG S. - HARMANEC P.; Department of Geophysics and Astronomy, The University of British Columbia; Vancouver, B. C. V6T 1W5; Canada; Astronomical Institute, Czechoslovak Academy of Sciences; 251 65 Ondrejov; Czechoslovakia

Submitted to: *Publ. Astronomical Society of the Pacific*

Preprints: G. M. Hill at the first address.

Abstract: The narrow absorption features superimposed on the rotationally broadened Mg II $\lambda 4481$ line of σ Andromedae A are almost certainly from the spectrum of σ Andromedae B which is shown to be a 33.01 day double-lined spectroscopic binary. The speckle interferometrically measured separations of Aa and AB indicate that the system contains at least two doubles separated by some 25 AU with the periods of A-a and Aa-B on the order of four and thirty years respectively.

Recent Unusual Activity in the Be Star FY CMa

PETERS G.J.; Space Sciences Center, University of Southern California; University Park; Los Angeles, CA 90089-1341; USA

Submitted to: *Astrophysical Journal*, part 2.

Preprints: G. J. Peters at above address.

Abstract: Striking activity observed in the circumstellar envelope of the Be star FY CMa (HR 2855, HD 58978) during 1987 April - May is described. In less than twelve days, dramatic changes were observed in H α and He I 6678. Whereas nightly CCD observations from April 16 - 20 showed an invariant H α emission feature ($V/R = 1.2$, $V/I_c = 1.9$) and a simple absorption profile for He I 6678 with very weak double emission components, a similar observation on May 2 revealed that the V lobe of the H α feature had increased in strength by 30%

while the He I line had developed into a structured, inverse P Cygni profile with a V emission intensity of $1.2 I_c$. This new spectral appearance persisted with only slight changes in the emission line profiles throughout the remainder of the observing run from May 2 - 6. High resolution *IUE* observations obtained two months before and during the event, further reveal that the changes in H α and He I 6678 were accompanied by the appearance of redshifted shell lines of intermediately ionized species such as S III and narrow violet shifted components in N V. Physical conditions in the N V and S III line formation regions are estimated and possible explanations for the activity, especially the simultaneous infall/outflow, are offered.

UV Resonance Lines of the Be Star and: A Sensitive Indicator of Circumstellar Matter

STEFL S.; Astronomical Institute, Czechoslovak Academy of Sciences; 251 65 Ondrejov; Czechoslovakia

To be published in: Proceedings of the 1987 Trieste Workshop on "Pulsation and Mass Loss in Stars" (summary).

Preprints: S. Stefl at the above address.

Periodic Be Stars in NGC 3766

VAN VUUREN G.W. - BALONA L.A. - MARANG F.; South African Astronomical Observatory; P.O. Box 9, Observatory 7935; Cape, South Africa

To be published in: *Monthly Notices of the Royal Astronomical Society*.

Preprints: L. A. Balona at above address.

Abstract: Fourteen Be stars in the young cluster NGC 3766 were observed for short period light variations in February 1987 over a continuous four-week run. Five of the stars are periodic with periods of the order of one day. Four of these had been previously observed in 1985. All show marked changes in amplitude and shape of the light curve, but the periods are the same as in 1985. One of the stars has changed from single-wave to double wave and another has changed in the opposite sense. There are very small but noticeable color variations indicating that the stars are bluest when brightest. No sign of multiperiodicity was detected within observational errors.

B I B L I O G R A P H Y

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(Compiled by A. M. Hubert, J. Jugaku, P. Koubsky, G. J. Peters, M. Ruusalepp, and A. Slettebak)

A Survey of Be Stars in the $\lambda\lambda 7500-8000$ Region

ANDRILLAT Y. - JASCHEK M. - JASCHEK C.: AA Suppl. 72, 129 (1988)

Effect of Balmer Continuum Absorption on Line Emission from Be Stars

APPARAO K.M.V. - TARAFDAR S.P.: APJ 322, 976 (1987)

Evidence for Cool Dust around the Be Star 23 Tau (abstract)

ASHOK N.M. - CHANDRASEKHAR T. - SAHU K.C.: BASI 15, 30 (1987)

Gamma Lupi does NOT Appear to be a Be Star

BAADE D.: IBVS No. 3123 (1987)

On the Continued Immaculateness of the Be Star Mu Centauri

BAADE D.: IBVS No. 3124 (1987)

H α Echelle Spectroscopy of Be Stars: An Atlas

BALLEREAU D. - ALVAREZ M. - CHAUVILLE J. - MICHEL R.: RMAA 15, 29 (1987)

The Short-Period Photometric Variability of Four Be Stars

BALONA L.A. - MARANG F. - MONDEREN P. - REITERMANN A. - ZICKGRAF F.J.: AA Suppl. 71, 11 (1987)

The Relation between the Visual Polarization and UV Narrow Absorption Lines in Irregular Be Star Variations

BROWN J.C. - HENRICHS H.F.: AA 182, 107 (1987)

The Interacting Binary Beta Lyrae II. Non-LTE Model Analysis and Evolutionary Conclusions

DIMITROV D.L.: BAC 38, 240 (1987)

Time Variability of Gamma Cassiopeiae in X-Rays

FRONTERA F. - DAL FIUME D. - ROBBA N.R. - MANZO G. - RE S. - COSTA E.: APJ 320, L127 (1987)

Detection of a New Be Star - γ Lup

GHOSH K.K. - KUPPUSWAMY K. - JAYKUMAR K. - ROSARIO M.J. - VELU C.: IBVS No. 3057 (1987)

Recent Onset of an Outburst in μ Centauri

GHOSH K.K. - VELU C. - KUPPUSWAMY K. - JAYKUMAR K. - ROSARIO M.J.: IBVS No. 3056 (1987)

Variable Shell Strength of Pleione (BU Tau)

GORAYA P.S. - TUR N.S. - RAUTELA B.S.: IBVS No. 3052 (1987)

- Highly Ionized Stellar Winds in Be Stars: The Evidence for Aspect Dependence*
GRADY C.A. - BJORKMAN K.S. - SNOW T.P.: APJ 320, 376 (1987)
- Recurrent Episodic Mass Loss in a B2e Star: 66 Ophiuchi, 1982-1985*
GRADY C.A. - SONNEBORN G. - WU C.-C. - HENRICHS H.F.: APJ Suppl. 65, 673 (1987)
- An Evolutionary Scenario for the Formation of Highly Eccentric Be/X-Ray Binaries*
HABETS G.M.H.J.: AA 184, 209 (1987)
- High-Resolution Emission Line Spectroscopy of Be Stars III. Balmer Line Profiles*
HANUSCHIK R.W. - KOZOK J.R. - KAISER D.: AA 189, 147 (1988)
- Epsilon Persei and Mu Centauri as Single-Periodic Rapid Variables*
HARMANEC P.: IBVS No. 3097 (1987)
- Studies in Be Star Variability 2. Analysis of Published Radial Velocities of Six Bright Emission Line Stars*
HARMANEC P.: BAC 38, 283 (1987)
- Spectral Features of the B2e Star EW Lac Before and During the Variable Shell Phase*
HUBERT A.M. - FLOQUET M. - CHAUVILLE J. - CHAMBON M.T.: AA Suppl. 70, 443 (1987)
- Additional Constraints on Cool Disk Models of Be Stars Based on Long Observational Sequences in the Visual Range*
HUBERT A.M. - FLOQUET M. - CHAMBON M.T.: AA 186, 213 (1987)
- Radial Velocity Study of the Be Star ζ Tau (HR 1910)*
JARAD M.M.: ASS 139, 83 (1987)
- On the Ultraviolet Fluxes of Be Stars (abstract)*
JOSHI S.C. - RANTELA B.S.: BASI 15, 26 (1987)
- Rapid Variation in H α Emission of γ Cassiopeiae*
JOSHI S.C. - SRIVASTAVA R.K. - SRIVASTAVA J.B.: IBVS No. 3116 (1987)
- The 68th Name List of Variable Stars*
KHOLOPOV P.N. - SAMUS N.N. - KAZAROVETS E.V. - KIREEVA N.N.: IBVS No. 3058 (1987)
- Spectrophotometric Study of H α and H β Emission Lines of ϕ Per*
MAMATKAZINA A.: PAAO, 48, 67 (1987)
- The Ultraviolet Spectrum of Beta Lyrae*
MAZZALI P.A.: APJ Suppl. 65, 695 (1987)
- Correlated Polarimetric and H Alpha Emission Line Variations in the Be Star zeta Tauri (abstract)*
McDAVID D. - GIES D.R.: BAAS 19, 1051 (1987)
- New H α Emission Stars in the Regions NGC 7000, IC 5068, and IC 5070*
MELIKIAN N.D. - MELNIKOV S.Yu. - SCHEVCHENKO V.S.: IBVS No. 3073 (1987)
- An Investigation of Rapid Variations of HD 200775, Be Herbig Star*
MINIKULOV N.Kh. - POGODIN M.A.: PAJ 13, No. 2, 132 (1987)

The Optical Counterpart of the X-Ray Transient EXO 2030+375
MOTCH C. - JANOT-PACHECO E.: AA 182, L55 (1987)

The Loss and Reestablishment of the Wind in 66 Ophiuchi in 1985
PETERS G.J.: PASP 100, 207 (1988)

On the Polarization of Herbig Ae/Be Stars
PETROVA N.N. - SHEVCHENKO V.S.: PAJ 13, No. 8, 686 (1987)

On Rapid Photometrical Variability of Some Ae/Be Star Envelopes
POGODIN M.A.: PAJ 13, No. 8, 695.

Hydrogen Emissions on Low Dispersion Spectrograms of B-Stars
RADOSLAVOVA T.: IBVS No. 3074 (1987)

Periodicities in X Persei (abstract)
RAJASEKHAR RAO N. - LOKANADHAM B. - RAMANUJA RAO K.: BASI 15, 25 (1987)

Different Regions of Line Formation in the Envelope of the Early Emission Line Star HD 190073
RINGUELET A.E. - ROVIRA M. - CIDALE L. - SAHADE J.: AA 183, 287 (1987)

Variations in the Envelope of the Shell Star HD 50845
SAHADE J. - RINGUELET A.E. - ROTSTEIN N.: PASP 99, 971 (1987)

Spectrophotometric Study of the Be Star 23 Tau
SAPARGALIEVA L.: PAAO 48, 76 (1987)

Radio Detection of the Be Star Psi Per
TAYLOR A.R. - WATERS L.B.F.M. - LAMERS H.J.G.L.M. - PERSI P. - BJORKMAN K.S.:
MNRAS 228, 811 (1987)

Continuum Energy Distribution of 48 Persei
TUR N.S. - GORAYA P.S. - CHAUBEY U.S.: ASS 139, 257 (1987)

IRAS Observations of Be Stars II. Far-IR Characteristics and Mass Loss Rates
WATERS L.B.F.M. - COTE J. - LAMERS H.J.G.L.M.: AA 185, 206 (1987)

Erratum: In the bibliography in Issue No. 15,
A Statistical Method to Estimate the Rotation of Be Stars
XIE G. - BAO M.: AAS 6, 271 (1986) should read CHEN H.Q. - HUANG L.: AAS, 6, 271
(1986)

Abbreviations used for the Publications

AA	Astronomy and Astrophysics
AA Suppl.	Astronomy and Astrophysics Supplement
AAS	Acta Astrophysica Sinica
AJ	Astronomical Journal
APJ	Astrophysical Journal
APJ Suppl.	Astrophysical Journal Supplement
ASS	Astrophysics and Space Science
BAAS	Bulletin of the American Astronomical Society
BAC	Bulletin of the Astronomical Institutes of Czechoslovakia
BASI	Bulletin of the Astronomical Society of India
IAJ	The Irish Astronomical Journal
IAUC	IAU Circular
IBVS	Information Bulletin on Variable Stars
IKAO	Izvestia Krimskoj Astrofiziceskoj Observatorii
MNRAS	Monthly Notices of the Royal Astronomical Society
MSAI	Memorie della Societa Astronomica Italiana
OBS	The Observatory
PAAO	Publications of the Alma-Ata Observatory
PAJ	Pisma Astronomical Journal
PASJ	Publications of the Astronomical Society of Japan
PASP	Publications of the Astronomical Society of the Pacific
QJRAS	Quarterly Journal of the Royal Astronomical Society
RMAA	Revista Mexicana de Astronomia y Astrofisica

M E E T I N G S

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IAU COLLOQUIUM 107 - ALGOLS

University of Victoria, Victoria, B.C.; Canada

August 15-19, 1988

There is compelling evidence to suggest that some Be stars have acquired their circumstellar envelopes through binary mass exchange. This mechanism not only provides an explanation for the source of the material but also the large angular momentum typically associated with Be stars. There are a number of Be stars that have been confirmed to be interacting binaries and there are several eclipsing binaries of the Algol type that would be considered only as classical Be stars if they did not eclipse! The purpose of IAU Colloquium 107 is to review recent progress and consider future directions in the study of interacting binaries of the Algol type. Some of the topics to be considered are:

1) Does the rapid phase of mass transfer really exist and is there a contact phase? What are the observable characteristics of systems at this phase, and how can we be sure that we can identify them correctly? [*Are there any Be stars among this population? ed.*]

2) What is the relation between the observed properties of the Algols and their initial parameters? What can be deduced about it from the available data?

3) What is happening near the accreting star in Algols? Is the material really accreted, or partly ejected? What role does accelerated rotation play?

4) Are there accretion disks in Algols? Are they optically thick or thin? How do they compare with those seen in cataclysmic variables?

5) What is the structure, extent, origin, and energy source of the circumstellar hot plasma, which radiates in the emission lines from the superionized species and perhaps in the continuum?

6) What is the nature of the cooler circumstellar absorbing shell? What is the radial structure of such a shell, and how is radiation transferred in it?

7) What is the chemical composition of the various components in the system? Is there evidence of CNO processing?

8) What is the future evolution of objects that we now observe as Algols?

9) What is the relation between Algols and other interacting systems, such as contact binaries, *Be stars*, cataclysmic variables, symbiotic stars, RS CVn stars, and what is the nature of borderline cases?

This meeting will take place after the IAU General Assembly in Baltimore, MD, U.S.A. and be held at Dunsmuir Lodge in Sidney, B.C., Canada. It will be centered on a number of invited talks followed by abundant time for discussion. An extensive poster program is also planned. For additional information, contact:

Dr. Mirek J. Plavec, Chairman of the Scientific Organizing Committee
Department of Astronomy, University of California
Los Angeles, CA 90024 U.S.A.
Telephone: (213) 825-1672