NEWSLETTER

OF

CHEMICALLY PECULIAR

RED GIANT STARS

Number 16 June 1994

Edited by
Sandra B. Yorka
Denison University

I. MESSAGE FROM THE WORKING GROUP CHAIRMAN

Plans for the meeting announced in the previous issue of this Newsletter are progressing well. We have a Scientific Organizing Committee, a Local Organizing Committee, a preliminary program, the support of four IAU Commissions, and assurances of support from several organizations in Turkey, the host country. Perhaps most important, we managed (barely) to submit a formal proposal to the IAU before the June 1 deadline, requesting that the meeting be supported as an IAU Symposium.

The basic parameters of the meeting, as specified in our proposal to the IAU, are the following:

Title: "The Carbon Star Phenomenon"
Date: Late May, 1996
Site: Antalya, Turkey
Meeting type: Symposium
Proposed by: IAU Working Group on Peculiar Red Giants
Sponsoring Commission: 45 (Stellar Classification)
Co-sponsoring Commissions: 27 (Variable Stars),
29 (Stellar Spectra), and
36 (Theory of Stellar Atmospheres)

Both the meeting title and the date have been revised since the previous issue of the Newsletter. We felt that the above title, rather than simply "Carbon Stars", better reflects our intention to discuss the general processes by which stars change their surface chemical compositions after leaving the main sequence. Although carbon stars are the most obvious examples of red giants with altered compositions, the meeting will draw attention to the fact that most stars manage to change their surface compositions to a detectable degree while still in the bright (i.e. red giant) phases of their evolution.

The date originally proposed, in the Autumn of 1995, ran into problems with 3 or 4 European meetings on stellar astronomy proposed for that period. We know of no problems with the May 1996 date.

The site is still Antalya, on the Mediterranean coast of Turkey. The more we learn about this city and its surroundings, the more excited we are about the prospect of holding a meeting there. Personally, I can't wait two years to go there, and so I will visit the LOC Chairman, Zeki Aslan, in Antalya during the first week of August to select a hotel site and start making arrangements. Thus by the time of the IAU General Assembly in The Hague, we should have made a firm commitment and settled the date (presumably either the week of May 20-24 or the week of May 27-31, 1996).

As we found at IAU Colloquium 106 in Bloomington in 1988, it is extremely valuable to have meetings from time to time that bring face to face the diverse group of researchers associated with our Working Group. We hope we have again found a theme of sufficiently general interest to appeal to all readers of this Newsletter and to many young astronomers entering the field of stellar astronomy. To emphasize the breadth of the subject matter, we solicited the support of the Presidents of four Commissions, and they all responded by writing letters of support to the IAU Assistant General Secretary. To be eligible for support as a Symposium, the sponsorship of two or more Commissions is required.

The question of IAU support for the meeting will be settled in The Hague on August 14, the first day of the General Assembly.

The proposed Scientific Organizing Committee (strictly speaking, the SOC is appointed by the IAU Executive Committee when they act on the proposal) is the following:

Zeki Aslan	-	Turkey
Hollis R. Johnson	-	U.S.A.
Uffe G. Jorgensen	-	Denmark
Thomas Lloyd Evans	-	South Africa
A. Mario Magalhaes	-	Brazil
Janet A. Mattei	-	U.S.A.
Monique Querci	-	France
Verne V. Smith	-	U.S.A.
Takashi Tsuji	-	Japan
Robert F. Wing (Chair)	-	U.S.A.

It is clear that the conference is being organized by our Working Group. Seven of the ten SOC members are current members of the WG's Organizing Committee, and Tom Lloyd Evans is a former member. The two other members, Janet Mattei and Zeki Aslan, are Turkish-speaking experts on photometry of variable stars. The group represents five continents and has had considerable experience in the organization of conferences.

The SOC has been working on the program for the meeting. We expect the meeting to take up a full week, with four days of paper sessions and one day, probably Wednesday, for a tour to the Turkish National Observatory, now under construction on Bakirlitepe, near Antalya. The following is an outline of the proposed program:

PROGRAM OUTLINE

Monday (emphasis on surveys and spectroscopy) -

- Historical introduction
- Surveys and statistics -- recognition of C stars, R stars, BaII stars, etc.; high latitude C stars; dwarf C stars
- Problems in the spectral classification of chemically-peculiar red giants
- Problems in constructing model atmospheres -- overview; molecular opacities, other opacity sources; spherical geometry; special problems
- Determination of fundamental parameters: Teff, L, M, R...
- Applications of high-resolution spectroscopy -- abundance determinations, isotope ratios, etc. Individual stars; BaII stars; halo and disk stars; low-mass stars in clusters

Tuesday (emphasis on photometry, variable stars, and binarity) -

- Survey of variables with altered abundances
- Visual light curves -- international cooperation and networks
- Photometric monitoring programs -- periodicity and chaos in the light curves of semi-regular and irregular variables
- Polarimetry
- Infrared light curves of carbon Miras
- Multicolor photometry, infrared photometry
- Uses of narrow-band photometry -- band-strength measurements; determination of Teff from comparison with models
- Evidence of binarity among cool stars with altered abundances; statistics of orbital parameters

Wednesday

- Bus tour to Turkish National Observatory
  (to include one or more talks by Turkish astronomers involved with the Observatory, now under construction)

Thursday (emphasis on layers above the photosphere) -

- Evidence for chromospheres in C and S stars; chromospheric models
- Dust shells of M, S, and C stars; C stars with silicate dust; correlation of dust signatures with optical properties; evolution of dust shells
- Circumstellar molecules -- microwave observations
- Mass-loss mechanisms; estimates of mass loss; production of large molecules and grains
- Grains in meteorites, and their relevance to C stars

(continued)

Friday (emphasis on stellar evolution) -

- Evolution on the asymptotic giant branch
- Production of C and S stars by single-star evolution; element nucleosynthesis; mixing mechanisms
- Production of light elements and s-process elements
- Origin of C stars through mass transfer in binary systems; recent results on main-sequence carbon and barium stars
- Post-AGB evolution; proto-planetary nebulae
- Summary of unanswered questions...

The SOC had specific speakers in mind when listing many of these topics, and the process of contacting Invited Speakers is underway. So far we have reached about 30 speakers who are not SOC members, and the great majority have agreed, at least tentatively, to attend and to give a talk; in fact only two invitees have declined. From this response we feel encouraged that the meeting will be well attended, especially by the sort of active researchers that we are asking to speak. We expect to contact a number of additional speakers during the summer, as time permits and e-mail addresses become available. The official First Announcement of the Symposium should be distributed in September or October, after we hear about IAU support, and at that time we will ask people to indicate their interest in presenting contributed papers.

The reaction of Turkish astronomers to our proposal has been most gratifying. Many of our Turkish colleagues have offered to help with the local organizing, saying that Turkey is overdue for an IAU-sponsored conference and that the proposed meeting would be good for Turkish astronomy. We sincerely hope that that will be the case. The Local Organizing Committee now has ten members, as follows:

Zeki Aslan, Chair	(Antalya)	Cafer Ibanoglu	(Izmir)
Cetin Bolcal	(Istanbul)	Varol Keskin	(Izmir)
Hulya Caliskan	(Istanbul)	Dursun Kocer	(Istanbul)
Osman Demircan	(Ankara)	Tuba Koktay	(Istanbul)
Orhan Golbasi	(Antalya)	Talat Saygac	(Istanbul)

Most of the Committee are IAU members; two are currently graduate students. The LOC includes both of Antalya’s astronomers but is really a national committee, representing the main centers of Turkish astronomy. Zeki Aslan is Chairman of the Physics Department at Akdeniz University in Antalya; his research interests include stellar kinematics and the photometry of variable stars. He also headed the site survey that led to the selection of Bakirlitepe for the new National Observatory. I would like to thank Dr. Aslan for agreeing to chair the LOC; he has already done a great deal on behalf of the meeting.

Largely through Dr. Aslan’s efforts, the meeting has several Turkish sponsors. TUBITAK, the Science and Technical Research Council of Turkey and the funding agency for the National Observatory, not only has agreed to provide transportation for our visit to Bakirlitepe but also has invited us to apply for a grant in support of the meeting. Two universities -- Akdeniz University in Antalya, and Istanbul University -- will provide support in the form of secretarial assistance, e-mail service, copying equipment, promotion, coffee, and so on. And the Turkish Astronomical Society has also indicated a desire to help.

During the first two weeks of August I will be in Turkey, talking to the LOC and making arrangements for the meeting. The first week will be spent in Antalya, the second in Istanbul. Then I fly to Holland, where I hope to see many of you at the General Assembly. In particular, I hope you will attend the Business Meeting scheduled for our Working Group on the morning of August 20 (see notice below), at which I can report to you on progress made in Turkey.

--- Robert F. Wing
Chairman, WG on Peculiar Red Giants

II. ANNOUNCEMENT

BUSINESS MEETING OF THE WORKING GROUP

We have been informed by Jacqueline Bergeron, General Secretary of the IAU, and Jack MacConnell, President of Commission 45, that the following time slot during the IAU General Assembly in The Hague has been reserved for a Business Meeting of our WG:

Saturday, August 20, 1994
9:00 - 10:30 a.m.
Business Meeting
Working Group on Peculiar Red Giants

We hope that many of you will be able to attend. The two main items of business will be:

(1) Officers for the next triennium. At this juncture there is considerable uncertainty regarding the future commission structure of the IAU and the continuance of its Working Groups. However, unless we are told to disband, we should prepare for the next three years by electing officers. Anyone with thoughts about this, or who wishes to nominate someone to be a member of the WG's Organizing Committee or its Chair, or who wishes to be considered for one of these positions, should please leave a note in Bob Wing's mailbox in The Hague. If unable to attend the GA, please ask someone who is attending to deliver your note. Additional nominations will be accepted at the Business Meeting.

(2) Plans for the meeting in Turkey. By August 20 we should know whether the meeting on "The Carbon Star Phenomenon" will be supported as an IAU Symposium. Bob Wing will have spent two weeks in Turkey immediately before the GA and will report on the latest developments. With luck, his presentation will be illustrated with glorious color slides of the meeting site. He will try to answer your questions concerning the program, speakers, transportation, costs, sources of support, the beaches of Antalya, and where to buy a carpet.

III. RESEARCH NEWS

T. Tsuji, K. Ohnaka (IOA, Univ. Tokyo) and K. Hinkle and S. Ridgway (KPNO, NOAO) have completed an analysis of the SiO first overtone band on high-resolution FTS spectra of six late M giants and two M supergiants. The observed line profiles of 28SiO can be well fitted by the predictions based on classical model atmospheres for M supergiants as well as for M5-6 giants, but strong lines of 28SiO show excess emission over the predictions based on classical model atmospheres for the latest M giants (M7-8 III). The authors suggest that emission of SiO from the outer atmosphere fills in the photospheric absorption.

Si abundances, determined from weak 28SiO lines, have been found to be near the solar value in the M (super)giants surveyed. However, if the f-values of SiO are to be revised upward, as was learned after the completion of this analysis, Si abundances appear to be sub-solar. Thus, determinations of elemental abundances may still not be free from some systematic effects. Many resolved lines and band heads due to 29SiO and 30SiO can be clearly identified in all the late M giant spectra surveyed. A reasonable number of well isolated weak absorption features for use as abundance indicators were found for each isotopic species. We found that 28Si: 29Si :30Si ratios are approximately the terrestrial values but more neutron-rich nuclei tend to be more abundant. For example, the 29Si/30Si ratio is found to be slightly less than the terrestrial value of 1.51 in all the M giants surveyed. Similar analysis turned out to be more difficult in M supergiants, but the 28Si/29Si ratio shows the same tendency as in M giants. Silicon isotopic ratios can not be modified during the evolution of red (super)giant stars themselves and may present the interesting possibility of tracing the evolution of isotopes in the interstellar matter from which stars are formed.

K. Ohnaka and T. Tsuji, with the collaboration of T.Okada (OAO, NAOJ), have nearly finished a survey of carbon isotopic ratios in a large sample of N, SC, and J type carbon stars. The carbon isotopic ratio determination was based on lines of the CN red system, located around 8000A. A CCD detector was used, which made it possible to obtain spectra of faint stars with a resolutoin of about 25,000. Nearly two thirds of the 62 N stars studied were found to have carbon isotopic ratios between 10 and 30. The number of N stars which have carbon isotope ratios larger than 30 is relatively minor. 14 SC stars of 16 studied were found to have a carbon isotopic ratio larger than 10; they had been recognized as 13C-rich from low resolution spectroscopy. These SC stars were generally classified as J type stars, but this result suggests that the classification may need to be reconsidered. The carbon isotopic ratios of 14 SC stars are distributed in the range of 10 to 50. Only two stars were found to have a ratio less than 10. All but one of the 29 J stars were found to have a carbon isotopic ratio less than 10, as expected from the band heads of 13C-bearing molecules that can be seen in their low resolution spectra. The most frequent ratio among J stars is 3 to 4. The sample of J stars used in this study includes several peculiar IRAS carbon stars with silicate emission; it is confirmed that the carbon isotopic ratios in these peculiar stars are indistinguishable from those in other J stars.

The results for N stars and SC stars are partly consistent with the scenario in which an M giant evolves through an SC star to an N star, as 12C produced during the helium shell flash is mixed to the surface. But

the result for J stars cannot be explained by this scenario; therefore, some other evolutionary process, which could further explain the occurrence of a silicate-emitting stage in their evolution, must be sought.
This database, which includes the spectra of more than one hundred carbon stars, is also being used for a radial velocity survey.

H. Habing (Leiden) is writing a review paper entitled "Stars and circumstellar OH masers" for the new series "The Astronomy and Astrophysics Review", the review series associated with the journal "Astronomy and Astrophysics". Requests for reprints and preprints are welcome and should be directed to: H. J. Habing, Observatory, Huygens Laboratorium, P.O. Box 9513, 2300 RA Leiden, The Netherlands or to the internet address: habing@strw.leidenuniv.nl

In a paper that has been accepted for publication by A & A, F. Pijpers (Uppsala) and J. Pardo and V. Bujarrabal (Yebes, Spain) present the results of short-time-scale monitoring of SiO maser emission (the v=1, J=1-0 transition) in four known strong sources. These sources were monitored nightly for a period of about a month. The aim of these observations is to investigate the possible presence of variations in the maser lines on time scales of a few days to weeks, due to sound waves propagating out from the central star. If sound waves are responsible for the mass loss of certain cool giants, as suggested by Pijpers and Hearn (1989) and Pijpers and Habing (1989), local variations in density and relative velocity are expected just above the stellar photosphere. These could give rise to variations in any narrow spectral line formed in this region, and therefore in particular in the SiO maser lines. Our observations indicate that variations in the line shape (leading to relative changes in the intensity of about 20%) occur in the SiO emission of Mira-type stars, within short time scales of 10-20 days. The main component of the profile variability is consistent with a displacement of the velocity centroid of the dominant maser peaks, by about 1 km/s in the average.
Apparent variations in the total line flux were also found but could be partially due to calibration uncertainties.

In a separate investigation Pijpers demonstrates that shocks in the atmospheres of pulsation giant variables do not necessarily interfere destructively with sound waves.
It has been claimed that in stellar winds traversed by strong shocks the mechanism for driving the wind by sound wave pressure cannot operate because sound waves cannot propagate past the shocks. It is shown here that sound waves can propagate through shocks in one direction and that this is a sufficient condition for the sound wave pressure mechanism to work. A strong shock amplifies a sound wave passing through it and can drag the sound wave away from the star. It is immaterial for the sound wave pressure gradient that the sound wave vector points towards the star. Since the strong shocks drag the sound waves away, the star itself is the source for the sound waves propagating towards it. A paper reporting this work is currently being refereed.

B. Plez (Niels Bohr Inst.) and D. Lambert (Univ. Texas) continue their investigation of circumstellar envelopes by long-slit high resolution spectroscopy of fluorescence lines (esp. KI at 7699 A) at McDonald Observatory. They found marked asymmetries around a few stars (see Plez and Lambert, 1994, ApJ letters, 425, L101). They will reobserve some of these stars in order to determine if the asymmetries are real structure in the winds or are only an effect of an asymmetric illumination by the stellar photosphere. This program is mainly aimed at checking if the assumption of spherical symmetry usually made in the derivation of mass loss from red giants is justified.

V. Smith (Univ. Texas), in collaboration with Plez, Lambert, and Lubowich, has just completed a survey of Li in 112 red giants stars of the Magellanic Clouds. The stars are of spectral types M, S and C. The Li I (6707 A) line is detected in 35 of these giants (29 S stars and 6 C stars). All stars with a measurable Li feature are on the AGB, with the majority being luminous S stars within the narrow luminosity range of -7.2 <= Mbol <= -6.0. Abundance estimates of lithium in these stars fall in the range of log eps(Li) = 1.0 to 4.0. The presence of Li in these highly evolved AGB stars is ascribed to hot-bottom convective envelope burning. A comparison of the Li abundances derived here with published models of HBCE shows reasonably good agreement.

Plez, Smith, Lambert and collaborators are now studying a sample of more than 200 galactic S stars for Li and s-process elements.

D. Kiselman (Nordita) and Plez are initiating a study of non-LTE formation of the Li I lines in AGB stars.

T. Lloyd Evans (SAAO) reports that observations of V Hydrae have been continued through the 1993-94 season. The star faded further and the emission of C2 bands and the resonance lines of Na, K and Rb strengthened again, having faded in the latter part of the previous season, and reached new peaks of intensity. The spectrum is almost cometary, being dominated by emission features in the green although the red spectrum is clearly that of a carbon star with additional emission lines.

Visual observations by the amateurs of the Astronomical Society of Southern Africa show that the fading to the deep minimum started in early 1992, contrary to what was suggested in IAUC 5852. Spectra taken at that time are unusual in showing the photospheric appearance of a hotter carbon star than at any time in the previous 5 years: could this indicate that the star ejected the outer layers of its atmosphere then? Observations two months apart showed this appearance, and the spectrum was normal again - that is, the silicon dicarbide bands which indicate a low temperature had strengthened - after another three months. Theories of the extreme outer atmospheres of carbon stars might be applied to see whether this explanation is feaible.

V Hya also has a companion with an accretion disk and possibly a jet (see MNRAS 248, 479, 1991). Continued observation shows that the violet continuum brightens and fades on a time scale of not more than 16 months, compared to the 14 years for Mira B. Characteristic spectral changes accompany the light variations. The disk/jet is much less affected by the dust absorption than the carbon star, so that it dominated the spectrum shortward of about 470 nm in early 1994.

Two other stars have shown signs of mass-ejection in 1994. The carbon Mira R Lep undergoes large although not repeatable changes in many spectral features, notably the sodium D lines. These have varied between about 2 and 10 A in EW round the cycle but were in weak net emission at the beginning of May. The potassium line at 769.9 nm was strongly in emission, but that at 766 nm was obscured by strong terrestrial absorption at the large zenith distance.

IRAS 06452-3456 is one of several early M stars with infrared excess at 2.2 microns; these turned up in a survey of stars with a 60 micron excess in the IRAS data. This star faded by over 2 mag at 1.2 microns, with a marked increase in the infrared excess, in early 1993 (recovery time about 60 days) and again in 1994. On both occasions H-alpha and the sodium D lines appeared in emission; at maximum light both are strong absorption features. This star differs markedly from V Hya in having an infrared excess relative to the loci in the JHKL two-color diagrams of red variables with dust, which V Hya always follows despite a large magnitude range. R Lep also fits these loci during its cycle.

A. Vanture, G. Wallerstein, and J. A. Brown (Univ. of Washington) have determined the abundances of the iron-peak elements Fe, Ni and Ti, the light metals Mg, Al and K and the s-process elements Rb, Y and Zr for the heavy-element stars ROA 371, ROA 5293 and ROA 3812 in the globular cluster Omega Centauri. ROA 3812 and ROA 5293 are clasified as S stars while ROA 371 is classified as a K5 barium star. The metallicities of ROA 3812, 5293 and 371 are [Fe/H]= -0.7, -0.8 and -1.0, respectively. Thus ROA 371 has a metallicity slightly higher than those of the red giants analyzed by Brown et al. (1991), and ROA 3812 and 5293 have metallicities near the upper end of the range for the cluster. All three stars show an excess of Al, which is common in the red giants of Omega Cen, and a mean excess of 1.4 dex in the s-process elements Rb, Y and Zr. In addition, all three stars are too faint to be asymptotic giant branch (AGB) stars according to current theory. Hence, they were either formed with their present composition, as suggested by Lloyd Evans (1983), or are binaries that have had their atmospheres polluted by a now defunct companion.

Based upon the dependence of [s/Fe] on [Fe/H] for the various s-process elements over a range from [Fe/H] = -2.0 to [Fe/H] = -0.7, we show that Lloyd Evans' hypothesis is probably correct. This shows that mass loss from AGB stars was contributing s-process elements to the intracluster gas for as much as 10(E9) years before Type Ia supernovae swept the cluster clear of gas and terminated star formation.

D. Alexander (Wichita State Univ.), now on sabbatical at Indiana University, continues work on opacities for cool gases. A new set of opacities incorporating the latest results for TiO and H2O from U. G. Jorgensen (NBI, Copenhagen), the latest atomic opacities from R. Kurucz (Harvard), pressure-induced opacities of H2 and He from A. Borysow (Mich. Tech. Univ.), and new grain opacities including silicate, carbon, SiC, and iron grains has been calculated by Alexander and J. Ferguson (Univ. Kentucky). These opacities, which have been carefully checked against other opacity calculations, cover the range in temperature from 600 to 15,000 K. Rosseland and Planck means are now ready for distribution and publication.

In collaboration with L. S. Anderson (Univ. Toledo), H. Johnson and graduate students R. Berrington, J. Jurcevic, and J. Robertson (Indiana Univ.) are studying the possible departures from LTE of Ti I in red-giant atmospheres. The interest in the problem arises from the importance of TiO both as an opacity source and as a spectroscopic determinant of temperature in red giant stars. If Ti I happens to be overionized or underionized, the pool of neutral Ti out of which TiO is formed might be changed, with a resulting change in the TiO number density.

Johnson and Alexander are investigating the levitation of stellar atmospheres by absorption of photospheric radiation by molecules. In particular, they are calculating the radiative acceleration due to molecules in a series of model atmospheres for Mira variable stars computed by G. H. Bowen. At most phases, levitation occurs (that is, radiative acceleration exceeds gravity) in some part of the atmosphere, and predicted mass-loss rates are considerable even in the absence of grain formation.

High-resolution UV observations of chromospheric emission in both Mu Gem (M3 III) and UU Aur (N3) have been obtained from HST by an international team lead by H. R. Johnson. Spectral lines have been identified and velocity shifts measured in both stars. Mu Gem shows the same kind of vertical circulation pattern as is seen in Gamma Cru. The entire chromospheric region in UU Aur seems to be accelerating outward.

P. de Laverny (Montpellier) reports the completion of his thesis "Radiation Effects in Extended Stellar Atmospheres: Application to the Formation of Emission Lines in Long-Period Variables". This thesis is concerned with the formation of strong emission lines seen in the spectra of Mira variables, especially those seen around the time of maximum light.

Non-LTE radiative effects that could be present in the hydrogen recombination zone were investigated. This region was studied by solving the equations of radiative transfer together with the equations of statistical equilibrium in a layer illuminated from one side. It is shown that strong emission lines created by fluorescence mechanisms emerge from this zone, which is found quite deep in the Mira atmosphere. It is proposed that cool spectral features are formed higher, mainly by pure absorption mechanisms.

It is suggested that the cycle of variations of the Miras results from the shift of the hydrogen recombination zone in the star. This region would be found deeper at the time of minimum luminosity. The emerging spectrum would then be cool without any lines. At the time of maximum luminosity the recombination zone would be formed higher and strong Balmer lines would emerge in emission.

IV. SPECIAL TOPICS

ORIENTAL ROBOTIC TELESCOPE NETWORK

Francois and Monique Querci
Observatoire Midi-Pyrenees
Toulouse, France

We should like to report on the network of Oriental Robotic Telescopes, otherwise the ORT network. Our objective is the non-stop observation of variable stars. Consequently we endeavor to set up a network of automated photometric telescopes as a complement to existing stations.

From 12-year archives of meteorological satellites, it appeared that sites having high-quality astronomical conditions with a significant annual number of clear nights are located around north tropical latitudes from 15 to 35 degrees and from 10 degrees West to 110 deg. East in longitude. Such sites involve Islamic countries from Morocco to the Taklamakan desert in China.

In fact, the Islamic countries are suitable because they have high mountains in semi-desertic areas, i.e. a clean sky with low telluric absorption. Also, they are in a longitude interval complementary to the automated stations already devoted to variable-star observations at sites such as the Hawaiian volcano, the Arizona mountains, the Chilean cordillera, the Etna volcano in Sicily, and the South African desert.

The final site selection will be based upon local astronomical tests, such as seeing and scintillation measurements.

The meteorological prospecting together with the local access facilities ought to give a list of sites not subjected to the same airstreams. The minimum number of stations (10 to 12) able to follow variable stars each night without interruption will be defined. The satellite meteorological data of sites such as West Tunisia, the North-West of India, and the Pamir and Taklamakan deserts are not yet analysed.

The scientific and/or technical participation as well as the financial support of national laboratories will be discussed during a Workshop to be held in Jordan in September 1994.

As for the photometric technique, we advocate differential photometry which, of course, implies a comparison of the flux of the variable star, V, with the flux of two comparison stars, A and B, known to be non-variables and which are located in the neighborhood of V. Generally speaking, this technique uses one telescope and a photometer with a filter-wheel and photomultiplier, and it involves consecutive measurements. It is time consuming, because a large fraction of the dark time is spent on telescope maneuvers for pointing and observing the variable star and the comparison stars successively. Also, if the sky transparency changes a bit during the run, the result is a loss of accuracy due to variable telluric conditions.

Using three telescopes with photomultipliers as receivers to observe the three stars V, A, and B simultaneously (one star per telescope), or only one telescope with a large field and sophisticated instrumentation in the focal plane (a battery of large CCDs), are two alternative ways of obtaining simultaneous observations of the three stars, leading to improved accuracy and a saving of observing time.

The design of a complete typical station: weather unit, telescopes, photometers, antenna for satellite communications, etc., has been produced at the Observatoire de Haute-Provence, France. There, engineers have analysed the advantages and the disadvantages (reliability, price, etc.) of each of the two techniques that permit simultaneous star observations. After having tested the multiple telescope solution with small telescopes, a 1-m diameter telescope prototype with a large field and a battery of CCDs is now being tested.

We emphasize that, in this technique of simultaneous observations of the three stars, better accuracy is reached even when the sky conditions are slowly variable, and that there is no loss of night observing time by telescope maneuvers from one star to another, or by successive observations of comparison stars: 90 per cent of the dark time is devoted to the variable star as against 15 per cent in the usual single-telescope technique.

The final choice between the multiple-telescope technique with photomultipliers as receivers and the single large-field telescope with a battery of large CCDs will depend on many factors, such as the type of research projects foreseen, the technical advantages of each technique, and their relative cost.

The data collected by each station will be transmitted by telecommunication satellites to all the scientific centers of the network, making common data reductions possible.

The ORT network, a network of robotic telescopes, will complement the automated stations located in other longitude intervals, allowing collaborative variable-star programs to be run in a non-stop way for several nights or weeks.

V. E-MAIL DISTRIBUTION LIST

Here we present the e-mail addresses, and the corresponding real names, to which the electronic version of this issue of the Newsletter is being sent. The list is arranged alphabetically by surname.

When we sent out a request for Newsletter material recently, a substantial number of messages were not delivered. Many of the ones that "bounced" were Bitnet addresses, several of them 4 or 5 years old. We have subsequently replaced many, but not all, of these with Internet addresses.

Please check your entry below to see that we have your preferred e-mail address. If you would like us to use a different address, or if you would like to be added to the distribution list, send a message to that effect to the Editor:

yorka@cc.denison.edu

If we receive a significant number of additions and corrections, we will publish a revised listing in the next issue of the Newsletter.

We hope that readers will find this list useful as a convenient way of keeping in touch with colleagues.

hrsake@stars.gsfc.nasa.gov	Ake, Thomas
dra@twsuvm	Alexander, David
lacplesis@astra.mii.lu.lv	Alksnis, Andrejs
baliunas@cfa.harvard.edu	Baliunas, Sallie
barnbaum@attila.cv.nrao.edu	Barnbaum, Cecilia
wbauer@annie.wellesley.edu	Bauer, Wendy
blommaert@hlerul51	Blommaert, J.
bwb@utphya.phya.utoledo.edu	Bopp, Bernie
s1.ghb@isumvs	Bowen, George
brewer@geop.ubc.ca	Brewer, James
ab@jila.colorado.edu	Brown, Alex
jbrown@astro.washington.edu	Brown, Jeffery
dcarbon@nas.nasa.gov	Carbon, Duane
hrscarpenter@hrs.gsfc.nasa.gov	Carpenter, Ken
santo@astrct.infn.it	Catalano, Santo
gcayrel@frmeu51	Cayrel de Strobel, Giusa
cowley@astro.lsa.umich.edu	Cowley, Charles
luc@iac1.dnet.nasa.gov	Crivellari, Lucio
crowe@uhccux.bitnet	Crowe, Rick
minnaert@hutruu51	De Jager, Cornelis
laverny@graal.univ-montp2.fr	de Laverny, Patrick
dainis@astro.lu.se	Dravins, Dainis
dupree@cfassp.harvard.edu	Dupree, Andrea
eatonja@ctrvax.vanderbilt.edu	Eaton, Joel
moshe@ukcc.uky.edu	Elitzur, Moshe
ke@laban.uu.se	Eriksson, Kjell
ajf10434@mailszrz.zrz.tu-berlin.de	Fleischer, Axel J.
fcfoy@frmeu51	Foy, Francoise
foy@frmeu51	Foy, Renaud
friedjung@friap51	Friedjung, Michael
gallino@astrto	Gallino, Roberto
garrison@centaur.astro.utoronto.ca	Garrison, Bob
gaustad@swarthmr.bitnet	Gaustad, John
fgafa00@blekul11	Goossens, Marcel
dfgray@uwovax	Gray, David
bg@laban.uu.se	Gustafsson, Bengt
habing@strw.leidenuniv.nl	Habing, Hans
jhakk@msus1.msus.edu	Hakkila, Jon
gmh@capybara.colorado.edu	Harper, Graham
ahearn@fys.ruu.nl	Hearn, Tony
roberta@aps1.spa.umn.edu	Humphries, Roberta
irwin@otter.phys.uvic.ca	Irwin, Alan

ivezic@astb.pa.uky.edu	Ivezic, Zeljko
u01117@frccsc21	Jaschek, Carlos
johnsonh@ucs.indiana.edu	Johnson, Hollis
uffegj@nbivax.nbi.dk	Jorgensen, Uffe
ajorisse@astro.ulb.ac.be	Jorissen, Alain
judge@hao.ucar.edu	Judge, Philip
jura@bonnie.astro.ucla.edu	Jura, Michael
jhk@juggler.mit.edu	Kastner, Joel
kenyon@cfa.harvard.edu	Kenyon, Scott
rkoch@pennsas.upenn.edu	Koch, Robert
kwok@iras.ucalgary.ca	Kwok, Sun
johnl@thala.maths.monash.edu.au	Lattanzio, John
likkel@rigel.astro.uiuc.edu	Likkel, Lauren
jlinsky@jila.colorado.edu	Linsky, Jeff
ilittle@lucy.wellesley.edu	Little-Marenin, Irene
tle@mv.saao.ac.za	Lloyd Evans, Tom
lutter@iuesoc.gsfc.nasa.gov	Luttermoser, Don
macconnell@stsci.edu	MacConnell, Jack
maehara@kibi.oao.nao.ac.jp	Maehara, Hideo
magalhaes%iagusp.decnet@ fapq.fapesp.br	Magalhaes, Mario
AAVSO@cfa0.harvard.edu	Mattei, Janet - AAVSO
emen@unamvm1	Mendoza, Eugenio
menes@frmop11.cnusc.fr	Menessier, M.-O.
muchmore@umtlvr	Muchmore, David
netzer@techunix.technion.ac.il	Netzer, Nathan
ng@hlerul51	Ng, Y.
lnyman@eso.org	Nyman, Lars
hans@astro.su.se	Olofsson, Hans
3y2lw5g@cmuvm.csv.cmich.edu	Osborn, Wayne
papoular@32779.decnet.cern	Papoular, Renaud
frank.pijpers@astro.uu.se	Pijpers, Frank
catyp@noao.edu	Pilachowski, Caty
plez@nbivax.nbi.dk	Plez, Bertrand
querci@obs-mip.fr	Querci, Francois & Monique
alvio@alma02.cineca.it	Renzini, Alvio
richer@astro.ubc.ca	Richer, Harvey
samus@airas.msk.su	Samus, Nikolai
schwarz@dgaeso51.bitnet	Schwarz, Hugo
1679@dbotuzo1	Sedlmayr, Erwin
shawl@kuhub.cc.ukans.edu	Shawl, Steve
shcherbakov@cc.helsinki.fi	Shcherbakov
bas@lowell.edu	Skiff, Brian
verne@astro.as.utexas.edu	Smith, Verne
snyder@prairie.astro.uiuc.edu	Snyder, Lew
rstencel@diana.cair.du.edu	Stencel, Bob
truran@nova.uchicago.edu	Truran, James
ttsuji@c1.mtk.nao.ac.jp	Tsuji, Takashi
ndt@astro.princeton.edu	Tyson, Neil
i98@dhdurz1	Ulmschneider, Peter
vdbliek@hlerul51	Van der Bliek,
wecj@cuphyd.phys.columbia.edu	Van der Veen, Wil
vanturea@gar.union.edu	Vanture, Andrew
viotti@irmias	Viotti, Roberto
wall@orca.astro.washington.edu	Wallerstein, George
williamson@stsci.edu	Williamson, Ramon

s1.law@isumvs	Willson, Lee Anne
wing.1@osu.edu	Wing, Bob
yorka@cc.denison.edu	Yorka, Sandy
zuckerman@bonnie.astro.ucla.edu	Zuckerman, Ben
zwaan@fys.ruu.nl	Zwaan, Cornelis
library@stsci.edu	Library, STSCI
astlibr@vela.astro.utoronto.ca	Library, U. Toronto

VI. MEETINGS

August 15-27, 1994
IAU General Assembly
The Hague
The Netherlands

August 15-19, 1994
Stellar Populations
IAU Symposium 164
The Hague, The Netherlands
Contact: E. van den Heuvel
edvdh@astro.uva.nl

August 29-September 2, 1994
High Spectral Resolution/Laboratory and Astronomical Spectra
Brussels, Belgium
Contact: A.J. Sauval
jacques@astro.oma.be

September 25-28, 1994
NRC/HIA Spectroscopy Conference
Ste-Adele, Canada
Contact: D. Ruest
NRC,Ottawa

October 13-15, 1994
High Resolution Spectroscopy with Very Large Telescopes
Tucson, Arizona
Contact: T. Kinman
kinman@noao.edu

February 6-10, 1995
Cape Town, South Africa
Astrophysical Applications of Stellar Pulsation
Contact: R. Stobie
pulsation@saao.ac.za

October 3-6, 1995
Florence, Italy
9th Cambridge Workshop: Cool Stars, Stellar Systems, and the Sun
Contact: R. Pallavicini
pallavic@arcetri.astro.it

VII. THE WORKING GROUP ORGANIZING COMMITTEE

Hollis R. Johnson
Astronomy Dept.
Swain West 319
Indiana University
Bloomington, IN 47405
USA
johnsonh@ucs.indiana.edu

Uffe Grae Jorgensen
Niels Bohr Institute
Blegdamsvej 17
DK-2100 Copenhagen
Denmark
uffegj@nbivax.nbi.dk

Antonio Mario Magalhaes
Instituto Astronomico
e Geofisico
Universidade de Sao Paulo
Caixa Postal 9638
Sao Paulo, SP 01065-970
Brazil
magalhaes%iagusp.decnet
@fapq.fapesp.br

Monique Querci
Obs. Midi-Pyrenees
14 Avenue Edouard Belin
F-31400 Toulouse
France
querci@obs-mip.fr

Verne V. Smith
Dept. of Astronomy
University of Texas
Austin, TX 78712
USA
verne@astro.as.
utexas.edu

Robert E. Stencel
Dept. of Physics &
Astronomy
Univ. of Denver
Denver, CO 80208
USA
rstencel@diana.du.edu

Takashi Tsuji
Institute of Astronomy
University of Tokyo
Mitaka
Tokyo 181
Japan
ttsuji@c1.mtk.nao.ac.jp

Robert F. Wing
(WG chairman)
Dept. of Astronomy
Ohio State Univ.
174 W. 18th Avenue
Columbus, OH 43210
USA
wing.1@osu.edu

Sandra B. Yorka
(Editor)
Dept. of Physics &
Astronomy
Denison University
Granville, OH 43023
USA
yorka@cc.denison.edu