DISCUSSION OF POSTER PAPERS : SECTION II

Anthony-Twarog - uvby photometry with a CCD

Graham: Did you have any trouble with interference fringes when using Strömgren filters with a CCD?

Anthony-Twarog: We had no trouble with interference fringes with such narrow filters, even for the y-filter where the night-sky line normally produces problems.

Belserene - Photographic monitoring

Graham: You work on period changes. Do you choose well-behaved RR Lyrae stars?

Belserene: We do not know in advance, but we have at most about 25 plates per year. If there is significant period behaviour within ~ 3 months, then we can not do much about the star.

Latham: How faint can you work with your system?

Belserene: 15 mag. in Milky Way. At 4 arcmin/mm the Milky Way then becomes an extended object. 17 mag at high galactic latitudes. These are one hour exposures on 103 aO plates.

Osborn: I would like to comment that for those with small telescopes and samll budgets that preclude CCD systems and the like, this type of work is very worthwhile. Although photographic photometry may have large zero point errors, this is not important for the timings of maxima or minima necessary for period change studies.

Warner: If one starts observing now one has to wait 15-20 years to detect period changes.

Garrison: Christine Clement has been doing work of this kind for 15 years with the Toronto 60cm telescope in Chile. The globular clusters pass directly overhead there and she has found quite a number of period changes and double periods. It is quite useful work that can be done with a small telescope and minimal reduction equipment.

Hazen-Liller: I would like to mention the Harvard patrol program being carried out in the southern hemisphere here at Mount John, and in the northern in Massachusetts. These plates have recently been used, for example, by Steve Shawl to determine recent

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ephemerides for long period variables. The collection at the Harvard College Observatory is open to any astronomer wishing to use it.

Bembrick et al - Cometary astrometry with the Sydney Observatory.....

Millis: What astrometric accuracy are you able to achieve and do you have any interest in asteroid astrometry?

Bembrick: We hope to achieve $\lesssim 1/10$ arcsec accuracy but we do not have enough plates to say whether we are at this limit yet. One of our plans is to do minor planet work.

Sullivan: Being an Australian institution why do you call yourselves the British Astronomical Association?

Bembrick: We are a branch of the BAA, the last surviving one, I believe, in a once worldwide empire.

Burki - The empirical period-radius relation for pulsating stars

Latham: This is an outstanding effort which has been organised out of Geneva to do 50,000 precise stellar radial velocities (< 1 km s^{-1} accuracy of stars down to 14th mag) using small telescopes in both the northern and southern hemispheres. A great team effort, due largely to Mayor but with many collaborators around Europe. When are you going to go to the globular clusters and give us a good distance scale?

Burki: We need larger telescopes. We tried to observe RR Lyrae stars in the globular clusters with the 1.5 m Danish telescope at ESO and obtained marginal results.

Graham: Could you comment on how the Baade-Wesselink method works for giving absolute magnitudes? Do you think it is at all dependent on structural features in the atmosphere (e.g. different lines forming at different depths in the atmosphere)?

Burki: The Baade-Wesselink method makes the assumption that the radial velocity and photometric measurements are sampling the same parts of the star. At minimum radius there seem to be some problems with the method. For RR Lyrae stars we exclude the phase of minimum radius.

Evans: If you have radial velocities and V,R photometry for Magellanic Cloud Cepheids you have a gold mine.

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Cameron - Starspot imaging using VRI photometry

Mochnacki: Two groups (Penrod and Vogt at Lick and Rucinski and Horne at Cambridge) have tried this technique and failed. The use of VRI photometry, giving colour information, is an important step forward.

Rucinski: I think that the main point of the technique presented by Collier and Horne is that they defined a proper function "f" to be optimized, so that they avoided having bright spots adjacent to dark spots.

Warner: The doppler imaging technique has recently been put forward with comments that suggest that it is a new invention. But Otto Struve suggested the principle at least 30 years ago - a point that I have included in my own spectroscopy lectures for about 20 years.

Evans: Only looking at photometry doesn't constrain the spot. One needs to have very high signal to noise spectra as well.

Innis: I'd like to draw attention to the earlier observations of this star which show minimum light to be brighter than maximum light in the present series. This may mean that the star is more heavily spotted than the current model indicates.

Cameron: It is difficult to tell from a single dataset whether the long-term variations in mean flux from this star are caused by variations in the total emergent flux or geometric rearrangements of the starspot distribution. We need several datasets obtained at intervals of a few weeks in order to see just how the starspot distribution evolves with time, and whether the apparent variations in mean luminosity can be modelled purely in terms of the starspot distribution.

Genet: A 0.4 m automatic telescope on Mt Hopkins operated by Vanderbilt University (D.S. Hall) will soon begin UBVRI monitoring of all known (~60) RS CVn stars brighter than ~11 mag in the northern sky.

Evans: I would hope that you would add M dwarfs with traces of hydrogen emission since these are almost certain to show spots.

Djorgovski and Ebneter - A search for features in early type galaxies

A'Hearn: Have you used both your model-subtraction method and the Sekanina-Larson method on the same object to compare performance?

Djorgovski: Yes, it turns out that model galaxy removal works better for galaxies because you put in real isophotal information. For comets, the other technique would work better.

Scarfe: A very similar technique has been used by Gillman and Pritchet in Victoria to detect globular clusters all the way to the centre of M87.

Djorgovski et al - The structure of globular clusters

Warner: For what fraction of galactic globular clusters do you have surface density distributions?

Djorgovski: Approximately 90%. Combining with data from the literature there is some sort of profile for 135-140 globular clusters. We intend to completely reassess cluster morphology. Some of the clusters have no previous data, except photographs.

Duncan - Stellar activity

Gaustad: How small a telescope could one use for this work?

Duncan: On the 60" our magnitude range is $m_V \sim 3$ to 6; with a 24" telescope one should probably work on the brighter red giants. We can keep only ~ 50 giants under surveillance at any one time.

Warner: There is also the southern hemisphere for which none of this sort of work has been done.

Duncan: That's right! For instance, α Cen has never been monitored for any type of variability.

Scarfe: It would be very interesting to find out the variation of rotation period along the subgiant branch. Are there enough subgiants whose H & K flux is adequate to do this?

Duncan: Subgiants seem to be the least active chromospherically, one needs to be more intensive and accurate in ones

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observations. There are a couple which have shown rotational variation. They are certainly worth further investigation.

Cameron: Modulation of CaII in known active subgiants (RS CVn type) is often not observed. This is due to the wide distribution of active regions over the stellar surface which means that the rotational modulation is not able to be extracted from the data. The strongest emitters appear to be the most heavily spotted and the most reliable way of measuring the rotation period is broadband photometry.

Duncan: Rule of thumb: Younger, heavily spotted stars are analysed more efficiently with braodband photometry. Older stars, use K-line photometry.

Garrison: I'd like to underline the fundamental nature and essential importance of this kind of work, which can only be done by hard work over a very long timescale with a small or under-subscribed telescope. An example of its use is found in a paper by Bruce Campbell and me last year, which showed that it is possible to determine the inclination of the polar axis by combining the activity data with Campbell's hydrogen fluoride radial velocity measurements.

Evans: I am astonished that there is no section on flare stars in this meeting where one needs small telescope monitoring for starspots, flares and other evidence of activity, often with more than one telescope. There are important programs of co-operation with spacecraft observations and for extended longitude coverage.

Gaustad: Detection of rotation in red giants seems to me very important, for it may potentially be a way of distinguishing pre-main-sequence from post-main-sequence stars. How does the angular momentum of your stars compare with that of main-sequence stars of the same mass?

Duncan: All the red giants for which we have rotation periods are rotating extremely slowly. They are slower than one would expect by extrapolating from the rotational velocities for A stars on the main sequence to the giant stars region, under any of the commonly discussed schemes of angular momentum transport. David Gray has suggested that a phase of magnetic braking affects red giants at a critical B-V $\sim$ 0.8 - 0.9. One problem that we have is that the odds are very high (9 out of 10) that when looking at the random giant star it is a "clump" giant which may have already lost substantial mass (and also angular momentum) during its first ascent of the red giant branch.

Gray: I want to comment on this very point. There is no ambiguity regarding the evolution, especially for subgiants. Their evolution, if you believe the evolutionary calculations, does not show any "blue loop", but is nearly horizontal across the HR diagram from the main sequence to the K giant region and then upward.

Therefore the rotational discontinuity is likely due to a brake which rapidly decelerates the rotation velocities, and it happens near G0 for luminosity class IV stars. The rotational break is at G5 for the giants of class III (ref. Gray 1982 Ap. J. 262, 682; Gray and Nagar 1985 Ap. J. 298, Nov. 15th issue).

Gehrels - CCD scanning with a small telescope

Wisniewski: A very successful program and a very good case for a completely dedicated telescope for specific projects: dark time - comet and minor planet work; bright time - radial velocity work.

Hazen-Liller - Search for variable stars in globular clusters

Graham: Are you planning to continue this important work to other globular clusters where variable star characteristics are now known well?

Hazen-Liller: I am planning to finish studying all unstudied southern clusters that can be done with the Yale telescope, and have already gotten plates for most of them. I hope very much to be able to get the remaining necessary plates in the coming semester, although the 1-m Yale telescope is technically no longer available for photography. It seems sad that such a superb wide-angle instrument as the 1-m is now only to be used to observe a single star at a time, while the 0.9-m intended to be used on-axis, is being used for wide-angle work, i.e. the CCD.

Ryan: How are you comparing your plates?

Hazen-Liller: I use a blink microscope to find the variables, and an iris photometer to measure the magnitudes.

Hill et al - EX Hydrae timing data

Warner: This paper illustrates the spin-up of the white dwarf by the shortening of the period.

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Ianna - Recent trigonometric parallaxes from two hemispheres.

Gliese: Some of the parallaxes of southern stars show very small observational errors, which are comparable with those from the north. Which other southern refractors are doing parallaxes:- The Cape, but it has a small output. Any other?

Ianna: No, but there is a proposal to do CCD parallaxes in Chile.

Warner: No observational work is currently being done with the Cape refractor. A new list of parallax stars will soon be published.

Gliese: We will soon know everything about photometry, variability and the velocity of objects in the southern skies, but we will not know their distance.

Gaustad: Is the parallax listed for NGC7293 the first parallax measured for a planetary nebula?

Ianna: No, this has a long history, starting with van Maanen who got $\pi = 0.04$(d=25pc). Our parallax puts it more than 100 pc away.

Innis et al - The Monash University Observatory: Equipment and research

No discussion of this paper.

Kennedy - Long-term period behaviour of contact binaries

Belserene: The details in the posted O-C diagrams show - as often pointed out at this meeting - the value of a small telescope which can accumulate a continuous data set. Without this the details would not have shown up.

Batten: I would like to underline the importance of the work discussed both in Kennedy's and Kreiner's (see later in this poster session) papers. Astronomers of the future will blame us if we do not determine times of minima. The task is ideally suited to small telescopes, as other papers in this session show. We should also remember that future generations may have different ideas from us about which systems are interesting. Therefore we should not confine our efforts to systems that interest us.

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Kviz - Phase-night diagram for periodic variable stars.

Warner: Has this program been used to coordinate observations at different sites around the world?

Kviz: No, not yet.

Knee et al - Photometry of RZ Ophiuchi - an international collaboration

Scarfe: This needed careful phasing and observations around the world to cover the interesting phases.

Warner: An interesting result that one can have circumstellar matter drifting around, without a current exchange of matter.

Scarfe: It is possible that RZ Ophiuchi has a stellar wind, which may feed the circumstellar disk.

Kreiner - Times of minima and period changes of eclipsing binaries

Scarfe: Could you comment on the recent decrease in activity from the previously very active Namberg-Izmir group?

Kreiner: The decrease is largely due to the death of Dr Ibanoglu.

Wood: Observing times of minima and publishing them is an extremely important use of small telescopes. Period changes inferred from these observations can be used to study the evolution of these systems.

Sterken: It is indeed very important to systematically observe times of minimum, but one should also consider that with a little extra effort one should try to cover the whole eclipse phase, or even more.

Malasan et al - Photometric research at Bosscha Observatory

Osborn: I was impressed by the fact that here we have a case where useful work is being done in spite of serious problems: a small telescope, a refractor with an unstable objective, a limited sky for the telescope, and poor weather. Often we hear that a

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telescope is not being used because it is old and not in good condition. Given a suitably selected program and perseverence these instruments can be used profitably, as shown in the present case.

Menzies and Marang - A new B subdwarf

Scarfe: This system appears to have an enormous reflection effect. Is this in fact the case, and what sort of object must the secondary be?

Menzies: Yes, the largest I've ever seen! It makes it difficult to get a light curve program to fit the data. The primary is about 26,000 K and the face of the secondary is heated to about 13,000 K - 2 or 3 times its effective temperature.

Garrison: How close are the two stars?

Menzies: About 0.4 $R_\odot$ and their radii are about 0.2 $R_\odot$.

Warner: It looks as though your star should be the nucleus of a planetary nebula, but at a temperature of 26,000 K the system is probably old enough that the nebula will have expanded to a low surface brightness. Can you put any limits on the existence of such a nebula?

Menzies: If our star is the nucleus of a planetary nebula - the nebula probably has been blown away. There is no evidence for it in the CCD frame (2 arcmin x 2 arcmin) or in the spectrum (no emission lines). This object is cooler (and more evolved) than a similar star, AA Doradus ($T_{eff} \sim 40{,}000$ K).

Sullivan: Which programs have you used to model the light curve?

Menzies: Wilson-Devinney and Graham Hill's 'Light' program. The latter has problems with the large reflection effect. The system seems to be a single-line spectroscopic binary.

Moffett - Photometry of selected Cepheids

Moffett: Two initial comments: (1) the list published is not complete, and (2) it is not intended just for professional observers but also for amateurs with photoelectric photometers.

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Scarfe: Thirty years ago Olin Eggen observed these stars and interpreted the variation as a bump, whose location in the light curve varied with period. How are these dips different?

Moffett: The bump Cepheids show an increase in luminosity during the bump portion of their light curve. The dip Cepheids show a clear decrease in light output during the dip phase. The theoretical models of Davis show a decrease in luminosity during the dip phase in the light curve.

Genet: Moffett asked for small telescope photometric observations by others including amateurs. A good way to obtain such observations is to place a written request in the IAPPP Communication. This journal goes to 600 professional and amateur astronomers in 40 countries. Advice on how to make such requests and follow up on them is given by R. Lines et al in IAPPP Communications issue No. 21. Typically amateurs with 8" - 12" telescopes are limited to the magnitude range 8 - 10.

Mohin et al - Photometry of the RS CVn binary II Peg

No discussion of this paper.

Osborn et al - Standard stars for comet photometry

A'Hearn: IHW comet filters have been distributed to ~ 70 observatories around the world. Standard stars have been observed so that all observers would have the same set of reference stars for the comet observations.

Djorgovski: Can you comment on the use of spectroscopic flux standards as an alternative to your standards? Then one can interpolate the standard's magnitude at the filter's effective wavelength.

A'Hearn: It's OK for very early type ($<$B2) spectroscopic standards. Other standards will produce different results because of strong absorption features, in particular the Balmer decrement.

Penhallow - Astrometry with small telescopes

Millis: What astrometric accuracy can be achieved with this system?

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Penhallow: On comets, e.g. Giacobini-Zinner, our residuals using the Schmidt are slightly less than 1 arcsec, which compares favourably with other larger (and more expensive) telescopes. The 0.4m has residuals of ~ 0.6 arcsec. On asteroids, we can do better than 0.1 arcsec.

Perry and Crawford - A description of a catalogue of bright uvby....

Warren: Do you distinguish between primary and secondary standards in your catalogue? Does the catalogue contain positions, proper motions and other parameters, which are so useful to the observer at the telescope?

Crawford: They are all primary standards. They are bright stars, so the catalogue does not fulfil the faint star standard need. However the catalogue is intended primarily for use with small telescopes. The catalogue does contain much useful information but we would be glad of your comments so that we can make additions.

Warren: Davis Phillip in IAU Symposium No 111 published standard star data for various photometric systems. I have been thinking for some time of compiling such a comprehensive machine readable catalogue.

Crawford: The list we are publishing is not a synthesis of all published uvby observations. It only includes the Tucson and Danish data.

Scarfe - Photometry of apsidal motion stars - a progress report

Kennedy: How many stars show apsidal motion?

Scarfe: I have about a dozen under observation, but there are many more.

Kreiner: About 50.

Warren - The use of machine readable astronomical catalogues at small...

Mochnacki: What thinking has been done about the use of Data Base Management Systems and the standardisation of data formats? What about access to large data bases via networks?

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Warren: Too many different formats make standardisation impracticable. However, CDS at Strasbourg are developing an on-line networking system.

A'Hearn: What networks are available for accessing data from either Goddard or Strasbourg?

Warren: Our data base of bibliographical information can be accessed directly by dial-up. It is not quite yet available on any of the standard networks. There is also work being done on networking Goddard to Europe.

Djorgovski: It would be nice but handling another persons software (and lots of it) could be a nightmare if bugs were found in the code.

Caton: The special interest group for Microcomputer use in Astronomy (SIGMUA), a subgroup of the AAS's Working Group on Astronomical Software, is setting up a telecommunications node at Goddard Space Flight Center. This will be used for exchange of programs and other ASCII text. It will operate under Kermit.

Mochnacki: Could I put in a plug for the standardisation of Kermit, since it is available on both mainframe and microcomputers?

Caton: Kermit has already been poorly implemented on some systems, not allowing the data from two machines to be transferred.

Wisniewski - Small telescopes and research from space

Garrison: The solution to the decline in small telescopes at national facilities could be simple in principle. Satellites should include ground-based support in their budgets. That would help small telescopes and provide the necessary data.

A'Hearn: Quite often it is a combination of space (e.g. IUE) and ground-based observations that give the best interpretation. I would support Bob Garrison's comment.

Warner: I would like the EXOSAT people to realize the limitations of optical observatories. We cannot observe in the daytime!

Garrison: They should also provide lists of objects requiring optical observations well ahead of time so that telescope allocation committees can accommodate their requests.

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Warner: In defence of the X-ray astronomers some of their requests are when they have received "target of opportunity" time.

Redfern: EXOSAT has quite restrictive pointing constraints. However, a given set of X-ray data can be improved by many orders of magnitude by having optical data (e.g. optical counterpart of an X-ray source in globular cluster M15). In addition, EXOSAT can get long continuous runs on a given object which can be coordinated with a number of ground-based stations separated in longitude.

Innis: Perhaps we have made the case to include small optical telescopes on future X-ray and UV satellites.

Woodward et al - Arcsecond IR imaging of the BN-KL star formation... .

Latham: The improvement in IR arrays is even more dramatic than in CCD's. They are going from 1 to >3000 InSb elements. (A 58 x 62 array from the Santa Barbara Research Centre is currently the best.) Not to mention the improvement in registration and photometry by having simultaneous channels. An IR CID for direct imaging out to 10 μm has been built by Aerojet which has been used by Goddard, The University of Arizona and the Smithsonian.

A'Hearn: There is also a 10-20 μm array, with many fewer pixels, which has produced some very interesting results in the last six months.

Woodward: We have just installed a continuously variable filter wheel, with 1% resolution, to do spectral line imaging in the IR. This will enable extinction to be measured to some of these regions using the hydrogen recombination lines. Small aperture telescopes are essential for use with these extended regions. Accurate astrometry can also be done and follow up photometry and polarisation work.

Crawford: I would like to add that much of this exciting new technology, on IR arrays and other items, will be discussed in depth at the next SPIE metting on Instrumentation in Astronomy, to be held next March (1986) in Tucson.

Zeilik - The RS CVn project at Capilla Peak Observatory

Zeilik: One could duplicate our hardware system for ~ $US85,000, and I would be happy to provide the software for those using an Apple Computer.

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