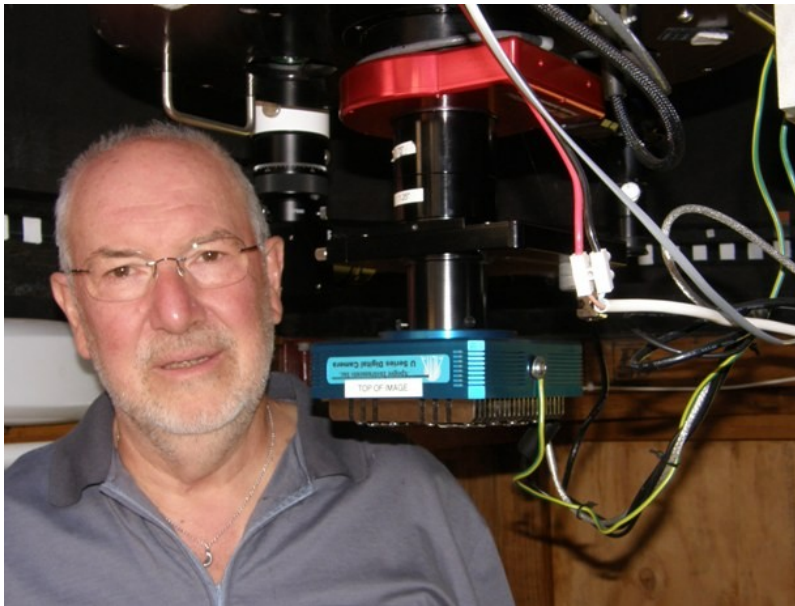


MEET VARIABLE STARS SOUTH

Tom Richards, Director, Variable Stars South, RASNZ

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It was 1927 when the late Frank Bateson started organizing variable star research in the Southern Hemisphere, and set up what became the Variable Star Section of the Royal Astronomical Society of New Zealand. It was 2005, 78 years later, when he retired from its Directorship. Under his control, the VSS-RASNZ effectively became responsible for all variable star observation south of a "Pope's Line" of -30 degrees declination, and developed a database of over two million observations, over a thousand charts and comparison sequences, and a

large number of publications. An outstanding legacy for possibly the greatest amateur astronomer of the twentieth century.

From the 1970s onwards, however, a new breed of variable star observer was emerging, who made use of electronic instrumentation and later, computers. This growing and productive stream was never properly integrated into the VSS, and with no clear succession plan in place, the Section was in the doldrums by the time of Frank's retirement. Pauline Loader heroically kept the Section ticking over, receiving observations and publishing newsletters, even though she was not a variable star person.

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In January of this year the Council appointed me the second Director of the VSS, RASNZ, under the new name of Variable Stars South. They did this on the basis of a development plan for VSS in which I set out my plans and goals. The first goal was to retain and develop the international southern role of VSS – not a New Zealand group. Indeed I live in Melbourne, though grew up in Karori, Wellington, hardly any distance from where Frank did.

A second goal was to transform Variable Stars South into an electronic organisation working on group projects. It will use all the modern resources of the Internet to bring together variable star researchers and observers around well-planned, focused projects.

To facilitate this the main organizational building blocks of Variable Stars South will be “Programmes” covering areas or styles of research, such as the two initial ones, Long Period Variables and Visual Research. These Programmes are deliberately not mutually exclusive, encouraging collaboration.

The centres of the real work, however, will be the Projects. These are targeted areas of observation and research, planned to carry out particular observations and analyses, and with definite outcomes in terms of publications, co-authored of course by all active Project team members.

Two initial Projects being planned are Dual Maximum Miras and Beginners’ Visual Observations. You will read the details of these in due course, but in each case what goes on will be the same. A “science case” specification of the Project will be developed, setting out aims and astrophysical significance, methods, and outcomes. In each such project spec, there will be an account of what sort of observing or other skills are needed, and of equipment. Then you will know if the Project is for you. At the same time, a plan for training and mentoring in the Project will be developed, to encourage new people to try their hand within a group of people all helping each other. My experience of one such project, run from the United States, suggests to me this is an ideal environment for encouraging people new to variable star research to join in, learning from the “old hands” in a supportive apprenticeship environment, and ending up quite quickly doing work they never realized they could, and getting their names on papers.

Who will be on these Project teams? Members of Variable Stars South of course. This is one of the privileges of membership; or put it another way: why join unless you want to team up to do variable star work? However anyone competent can propose a Project, and we expect many researchers outside of VSS may wish to work one up. One of the jobs of Programme Coordinators is to assist in setting up projects in their area.

What I’m painting is a picture of an organisation sponsoring, organising and running all sorts of serious, pointful, team-based research projects. An organisation that welcomes people into a team, gives them the skills, and helps them contribute to a valuable scientific outcome of which they are an immediate part. I believe this is important for recruitment. Many variable star people are scornful of amateur astronomers who “just” stargaze or take “pretty pictures”. I think this is to misunderstand their motivations and hence to fail to see how to make VS work attractive to them. Stargazing, taking pretty pictures, has enormous aesthetic satisfaction, considerable excitement, and a deep feeling of achievement. Ask anyone who’s done a “Messier Marathon”. And don’t forget the many technical competencies to be mastered. We fail to be attractive to these happy people if we just offer a list of stars to measure, which they don’t understand, and tell them to send off the results to join a distant archival database with thousands of other dusty records, which may not get pointfully used for decades. The Variable Stars South strategy instead is to explain the astrophysical excitement of a project, and to bring people in to small teams, usually geographically spread out but in close and private electronic communication, where they can learn, discuss, and ask silly questions of people they have come to know as colleagues. I’m betting my future as Director of VSS that this is the way to build up a vibrant ama-

teur-based research organisation.

But what of the archival database of the VSS-RASNZ as was? What of the need to take all those “spot observations” as I call them, destined for the archives, of all those stars on the VSS list? What of Albert Jones’s work? Please be clear: I regard that work, and continuing it, as vitally important for many reasons, some mentioned by Roger Pickard elsewhere in this issue. I’m just saying it’s no great recruitment poster for variable star observers. Through the work of Alan Plummer, Coordinator of our Visual Research Programme, this will continue; but no doubt in a more focussed way and with tighter collaboration and planning that can be facilitated through the Internet. However the old VSS-RASNZ database is no more. Through the efforts of Ranald McIntosh and people at AAVSO Headquarters in Cambridge, Massachusetts, all the RASNZ electronic data has been integrated with the International Variable Star Database managed by the AAVSO. Remaining boxes of paper data will be forwarded shortly to the AAVSO, where, using their considerable staff and resources, they will be analysed, transcribed into the IVSD, and made available to the world’s researchers in a much better way than we could. At last, one integrated worldwide database!

If you are taking “spot observations”, that is, not working inside a Variable Stars South Project but plugging away on your own piling up valuable data on favourite stars, please send your results direct to the AAVSO. We are not receiving them any more – in fact what Ranald has been doing for years is just forwarding them to the AAVSO anyway. So cut out the middle man, save our resources, and send to the AAVSO.

On the other hand, observations you do for a Variable Stars South Project will be held online in the Project’s area of our website, accessible just to Project members for discussion, evaluation, feedback and analysis, until results of interest to the wider world can be presented in our public areas – light curves, cleaned data, O-C diagrams, colour data, shape models – whatever matters. And then, of course, published in a journal; and if the data is appropriate, added to the IVSD.

Organisationally, Variable Stars South is starting with a clean sheet, no baggage. Our aim is to be as agile an organisation as we can; which means it is not being run by a committee! Officers of Variable Stars South, for example Stan Walker as LPV Coordinator, can organise their areas as they please subject only to the overall plans and goals of VSS. The Director is here to direct, not to run everything. Members’ blogs and egroups will provide vehicles for all members to partake in developing and running VSS. In fact its success will depend on that. In appointing the Officers of VSS I’m looking for creative people who are enthused by this model – not just variable star experts. Officers at present are:

Coordinator, Information and Communication Technology.

Michael Chapman of Sydney has this central facilitating role. Mike is prominent in Sydney City Skywatchers (<http://www.sydneycityskywatchers.asn.au/>) (BAA NSW as was), and their website is a credit to him. Mike will be implementing our website, www.varstars.org, largely as a wiki so we have maximum ability to interact in a group fashion on it. The site has hardly begun yet, but it will be the centre of operations. “Headquarters” is in cyberspace. If you have ICT skills, please contact Mike at MikeChapman@varstars.org to join his team. A dynamic and changing web presence is vital to VSS and its work, so help share the load, please! We hope the website will be reasonably developed within a month, and when it does you’ll be able to join the egroups, the blogs, the project data and discussion areas, and more.

Newsletter Editor.

Stan Walker of Awanui (somewhere about as far north as little old NZ gets) has taken this job up with enthusiasm. As a vehicle for communication within and outside VSS it will have a role not replaceable by emails, blogs, refereed online journal articles or anything else the twenty-first century serves up. Stan will be touting for articles and news and helpers. The whole publications area of VSS will obviously develop in many directions, and your ideas matter. Contact Stan at StanWalker@varstars.org.

Coordinator, Visual Research.

Alan Plummer also of Sydney (have you ever noticed how Sydney takes over everything?), is a dedicated champion of working with eyeballs and eschewing electronic gadgets; and is producing impressive papers involving much archival research. (Eyeball people are allowed to use the Internet.) He will be developing projects to strengthen visual research in the south, and these are ideal training ground for newcomers. Contact him at AlanPlummer@varstars.org if you want to use eyepieces instead of expensive toys.

Coordinator, Long Period Variables.

This also is Stan Walker, who has been working on Miras and SRs for decades. Stan is working up a couple of initial VSS projects, which will involve visual work (in collaboration with Alan) as well as CCD or PE instrumentation. Ideal for once-a-week observations.

Me.

Well, have a look at www.woodridgeobsy.org if you'll pardon the state of deconstruction it's been in since I took on this VSS job.

And more. It's not hard to think of further areas we need to have: cataclysmics, eclipsers, pulsators too short for Stan's interests, membership/finance, and others. But we must walk before we run, and setting this whole outfit up is a surprisingly big job. You can help, dear member, by getting into email conversation with one of the above, or me, with ideas and offers to work in projects. In fact the whole idea of VSS membership is to work in projects. Also we're looking for people to lead these other areas. You don't need to be the great variables guru, just have a passion for helping to expand southern variables research, and an ability to lead and encourage. And of course there are two more southern continents and not a few islands where we want VSS to be active – the Oz/Nz corner is not enough!



FROM THE EDITOR

Well, after Tom's introduction there's little left to say. Many observers in a variety of fields, CVs, LPVs, Cepheids and other variable stars have been concerned for some time that the structure set up by Frank Bateson was only idling along—in spite of the efforts of people like Pauline, Randal and Mati to keep it moving. But communications and direction are essential—something that Tom has now taken in hand. And having seen Tom's proposal to Council and read his comments above I am sure he's the man for the task.

Setting up the structure of Variable Stars South has been a time consuming for Tom—even for me on the periphery. And due to all of this there's not as much observational news in this issue as I'd like. More about organisation, etc., than we'd like but you need to know what's happening. Perhaps we were fortunate that one of the major events of the quarter—an outburst of a CV which is probably an eclipsing polar was too far north for us to observe. Even without this there's been some action over the summer and shortly, as daylight saving disappears, we'll be observing again at enjoyable hours.

And in the six weeks or so since Council's approval came through we've found out much about the southern scene—mainly NZ and Oz—but from places like Argentina and South Africa. But we'd like to know more, so keep the web site and the Newsletter in mind. What we can promise in the May issue is a much greater amount of observational material and some interesting projects—both for visual and 'electronic' observers.

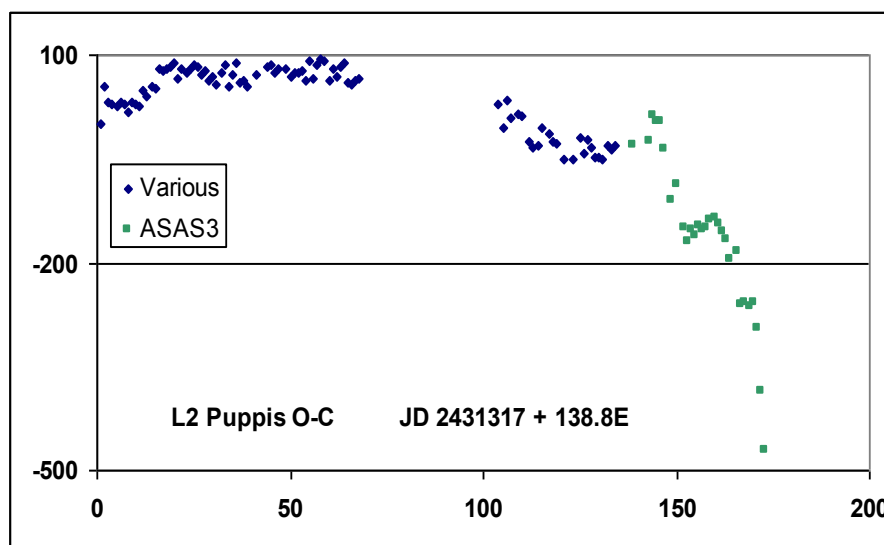


THE SEMI-REGULAR STAR L² PUPPIS—STAR OF THE MOMENT

Along with Mira itself this used to be every beginning observer's target. Varying from third to sixth magnitude in a little over four months, its light variations were easy to follow and they were reasonably quick. But no longer. About 15 years ago it began fading, apparently because of the ejection of a dust shell similar to the R Coronae Borealis stars, and it's now down at around seventh magnitude. Like many semi-regular stars its light variations show evidence of pulsation at two frequencies—138 and 100 days, with some small variations caused by alternations of two slightly different periods. A long term light curve appeared in Peter Williams' article in the November newsletter.

A way of studying the long term changes in a variable star is by using an O-C diagram. In this the observed epochs of maxima are plotted against the calculated dates, based upon an initial epoch and the average period of the star. L² Puppis was discovered more than a hundred years ago, but consistent measures by the VSS go back only to 1944, which is our zero point. During much of this interval of 64 years the period of the star was 138.8 days, although it became a bit shorter in the 1960s as the shorter, alternate period began to dominate.

Over the last decade or so the epochs of maxima have begun to occur increasingly early until now they are occurring over a year early—around 480 days on the diagram. In SR stars the light curves are often hard to interpret, and one or two extra cycles may have been added in error, but at worst the maxima are occurring a year early. As well, there are indications that the star has changed its pulsation mode to the next higher overtone.



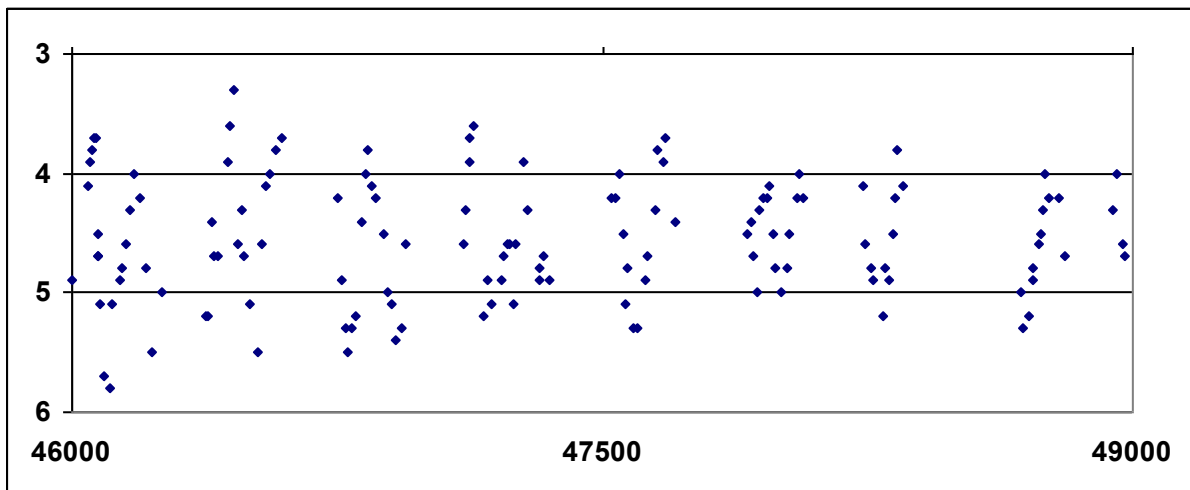
Observed epochs of L² Puppis plotted against the standard epoch and period. Those labelled various are mainly VSS visual measures, although there are some V epochs from Auckland Observatory.

The change of period is clearly evident, with one temporary return to the 'normal' period. ASAS3 epochs have been provided by Sebastian Otero, a visual observer in Buenos Aires, Argentina.

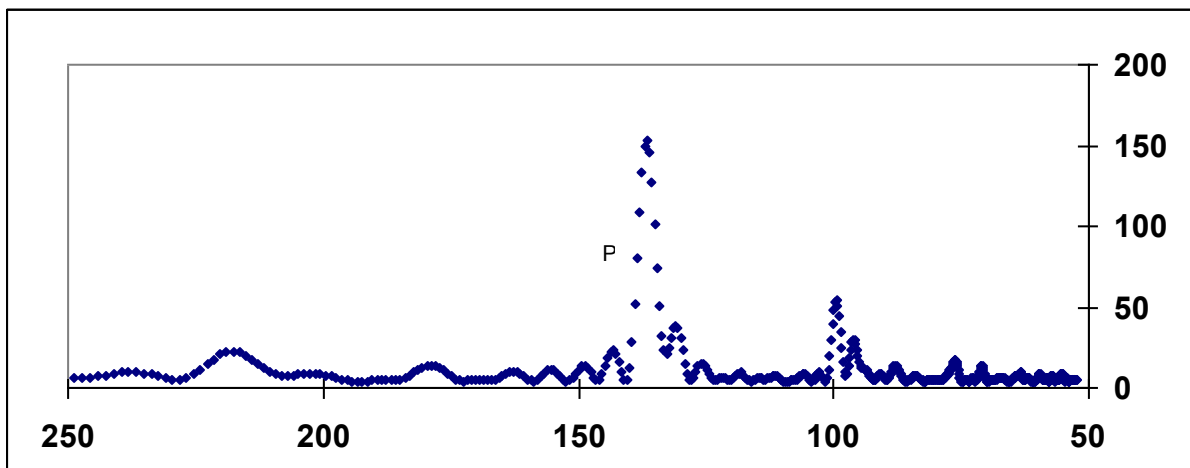
We would appreciate colour measures for a cycle or two—say until the star becomes unaobservable in the west. UB_V, VR_I, JH or whatever colours you can measure. Sebastian Otero is providing visual measures to complement the ASAS3 data, but one or two other experienced visual observers would be welcome. And, of course, when the star gets close to the Sun neither ASAS3, nor the CCD PEP observers will be able to get good measures and we rely heavily on the traditional visual observer.

We have V, B-V and U-B colours for a number of cycles when it was varying between magnitudes 3 and 6, Much brighter than at present and with a larger amplitude. These ceased about 1999 but cover the first five or six years of the current decline. Measures now would allow a comparison of colours which may be quite informative, providing some useful information about what is causing this decline, the lower pulsation amplitude and the changed period. Quite a lot of changes for one star!

While discussing L² Puppis we wish to emphasise an important point with SR stars—that it is better for a visual observer to concentrate on a small number of stars and observe them intensively, rather than make a few measures of many objects and produce what may be random data. Otero's measures of theta Apodis on page 12 show this in a dramatic manner. Naturally, some coordination is required to ensure that no star gets too many, nor too few, measures. But with the Internet, this is now easy to achieve. This second illustration shows Frank Ives' measures of L² over a 3000 day period. Regrettably, the Auckland weather does not always cooperate and the data shown are more typical of that which people have to analyse - with gaps, then closely observed data. This curve in a slightly different form was used in the last Newsletter, but it's needed again!



We searched this Ives data for periods using a routine written by me about 30 years ago embodying an algorithm developed for the Maria Mitchell Observatory. Software in those days was written by the user! The results appear below. Periods in days along the bottom, relative strength at the side.



There is a clear main period at 136.62 days, a subsidiary period at ~100 days and indications of a several others. Such multiple periodicities are usual for semi-regular stars - the beating together of the various frequencies is partly why the light curves are so messy. Note also another feature - both the strong periods are split. Many Miras and SR stars exhibit alternate periods separated by 1-3% and which alternate at intervals of 20-40 cycles. L² Puppis has been measured across just such a switch in periods. The more sparse PE measures (not presented here) showed similar results. When measures from a large number of observers were subjected to the periodogram it was much less clear and some of the subsidiary periods were not detectable. This happens also on longer period objects when five or ten day means are used. So the classical methods have some drawbacks.



VARIABLE STAR OBSERVING—SOME COMMENTS

Roger Pickard, Director BAA VSS

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The need for more visual observations

Stan Walker wrote in the last Circular that all types of observing of variable stars are complementary and that the Section would no longer be favouring one type over another. I heartily agree with this. The BAAVSS CCD observing programme relies heavily on visual observers reporting the outburst of an object so that time-series observations can be carried out, as noted by Tom Richards in the same Circular. In addition, sometimes, this works the other way around, and a visual observer will request a CCD image of an object that is at the limit of his telescope. But the visual observer does do much, much more. The vast majority of observations, if you discount time-series which are virtually the exclusive province of the CCD observer, are still made by the visual observer. Indeed, we need the visual observer to continue observing the same stars they've observed for many years. The reasons are primarily two-fold (although there are others). One, we still don't know nearly enough about the long-term behaviour of these longer period variables and as CCD observers tend not to monitor them at all, the only way we are going to get more information about them is for visual observers to continue their excellent work. Two, to obtain a homogeneous light curve going back decades, when visual observing was the only method available, we need said observers to continue their work so that the light curve doesn't have any blips in it due to a difference in technique; swapping from visual to CCD observing, for example.

Oh, I must also mention a third reason why visual observers should continue observing. Sadly, some observers seem to have been put off observing because they think that there is no longer any need for their observations due to so many automated surveys nowadays - many of them professional. Wrong! Such surveys are dependent, usually, on funding and if funding is withdrawn, end of project! Similarly, such projects are also often lead by one dedicated scientist and should he move on to pastures new, the project could fail. Therefore, please, please, visual observers continue your good work for the foreseeable future.

Projects

Many of the stars on "northern" programmes are readily accessible to southern observers and we'd like to see more southern observers taking them on. So, how about some joint observing projects to this end? For example, we've recently started a joint observing programme with the Society for Popular Astronomy here in the UK and would like to extend the idea further. However, this particular project is for a couple of stars quite high in the northern skies. So, how might southern observers care to take on some (all?) of the stars on the BAA VSS programmes (telescopic and binocular, principally, plus a couple of EBs) that have southern declinations? This amounts to almost 50 stars. If this is thought to be a reasonable idea, we could hone the list to concentrate on specific targets. Perhaps more of this is in a future Circular.

Disseminating information

Stan also mentioned that a couple of CD-ROMs had been put together as an aid for beginners. Another excellent idea.

A few years ago now, the BAA VSS produced a booklet on visual observing and followed this up with one on using a CCD for photometry. More recently, a small booklet dedicated to the binocular observer has also been published. We've also put all three, plus the contents of the web site and our Circulars going back to 1990, on a CD-ROM. This is especially good value for money and all these items are available from the BAA Office (office@britastro.org), by the way.

Eclipsing Binaries

Our own EB secretary, Des Loughney (des.loughney@blueyonder.co.uk) has been using a DSLR for the last year or two and found that, with careful observation and the correct technique, he can obtain an accuracy on the brighter stars of at least 0.03 mag. This compares very favourably with a "proper" CCD. More details about this appear elsewhere in this Circular in an article written by Des himself. One note though, I agree with Tom Richards, we need more input from theoreticians to analyse the observations (be they amateur or professional).

Mentoring

Finally (for now) I'd like to mention our Mentoring Scheme, details of which can be found on the web site. Basically, new observers are put in touch with an experienced observer, hopefully someone who lives not too far away. However, this is not always possible or convenient and the vast majority of contacts has been made via email or the telephone. This has proved very successful and produced a number of new observers; both visual and CCD, and so I would urge your newly re-formed Section to think about taking advantage of this method of training new observers. □

GREETINGS FROM THE FROZEN NORTH

Arne Henden, Director AAVSO

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We are just exiting the northern hemisphere winter, with about one more month of cold weather remaining. It has been particularly cold in Boston this year, but with a mixed bag of precipitation. The snow cover is just about gone, though they are predicting another snowstorm this week. Personally, I'm a fair-weather observer, and that means a couple of projects for which I need to perform some testing here at HQ are languishing!

Roger has covered a lot of projects that are complementary between the AAVSO and the BAA, such as visual observing and eclipsing binaries. As is obvious, there is great need for southern observers, and many of the important variables (like eta Car) can only be accessed by your group. I thought I'd just give you a brief summary of recent AAVSO projects that impact southern hemisphere observers.

Mati Morel's Snapshot

Mati has created a database of all southern sequences used by the RASNZ. Originally in Excel format, the database was reformatted by Mati into the special format that we use to add stars to our Variable Star Database (VSD). VSD is used by the Variable Star Plotter in generating charts with overlaid sequences for observers. The addition of Snapshot to VSD means that all southern charts will shortly be available through the AAVSO.

RASNZ Database

The AAVSO goal is to archive all of the historical observations from worldwide variable star groups, and make them available to researchers. The RASNZ is an obvious goldmine, with nearly 2 million observations collected over its history. The entire computer database was sent to the AAVSO several years ago, and many of the observations have been entered into the AAVSO International Database. Several important datasets remain, where the observer was not also an AAVSO observer and we have had to assign a new observer code to them. The import process takes time, as many of the more recent observations were submitted both to the RASNZ and to the AAVSO, and we need to remove these duplicate observations. They are not always completely identical, with different reporting formats, so it is a time-consuming process.

Recently, we've been negotiating with the RASNZ to obtain their paper observation archive. We expect several tens of thousands of additional observations to be included in that hardcopy archive, as many stars either were not included in the computer database, or had problems (such as letter sequences) that had not been resolved. Studying the paper archive will take considerable time, and we will be looking for volunteers in the Boston area to help us. We will give more on this project after we've resolved a couple of logistical issues with the VSS.

Mt. John 0.6m Optical Craftsman Telescope

The AAVSO is creating a small network (AAVSONet) of high-quality telescopes, with the specific purpose of making telescope time free to all members. These systems are all automated, running a queue of requests, and produce fully processed FITS images. While most of the initial systems are in the northern hemisphere, we are expanding south as time and resources permit. We have a Memorandum of Understanding between the University of Canterbury and the AAVSO to refurbish their 24-inch telescope on Mt. John. Dirk Terrell, Jerry Foote and myself did initial installation of new motor drives and computers in March 2008, and we will be back shortly to add a thinned, backside-illuminated CCD camera. Nigel Frost, Steve Barlow, Alan Gilmore and John Hearnshaw have given us enormous support in this project. Once operational, the OC will be a fully automatic telescope and will be used for campaigns, field calibration, GRB afterglow monitoring, headquarters research projects and projects from AAVSO members. The University of Canterbury gets a third of the time for their own research, plus access to the rest of the AAVSONet to obtain northern hemisphere observations.

The AAVSO Wide Field Photometric Survey

We are in the process of conducting an all-sky photometric survey in BVg'r'i' photometric bands, covering the magnitude range from 10th to 17th magnitude. This survey will be underway around May in the north, but will be moved to Chile in early 2010 for a two-year period to cover the southern skies. We expect this survey to provide calibration for all southern variable-star fields once and for all. It is a massive undertaking, but results will be released throughout the survey and available for sequence teams. On non-photometric nights, the survey telescope will be used for a variety of projects, many of which will provide data-mining opportunities for southern hemisphere observers. You can find more information about WFPS on the AAVSO website.

CCD Loan Program

We've loaned two DSI Pro cameras to the RASNZ for use by southern observers. We've also loaned two near-infrared single-channel SSP-4 photometers in the south (currently being used by Stan Walker and Jeff Byron). We expect to expand this program shortly with additional CCD cameras. CCD observers are few and far between in the southern hemisphere, so we hope this loan program will increase the number of observers performing CCD photometry of variable stars. We'll announce details through AVSON and the VSS shortly.

Let us know where we can be of assistance! The AAVSO has a long history of support for southern observers, and I don't see any reason why this cooperative activity won't continue for the indefinite future. Clear skies!



LOAN CAMERAS

As noted above the AAVSO would like to get more people doing CCD Photometry in the south. So if you're interested in obtaining one of these cameras—or finding out what they're capable of—contact Stan Walker at stan.walker@varstars.org, preferably by the end of March. They're easy to use and the results are encouraging. You'll need computer facilities and we'll put you in touch with the appropriate software for translating the images into real measures.



VISUAL OBSERVERS NEEDED

*Alan Plummer, Visual Observations Coordinator
Linden Observatory*

alan.plummer@varstars.org

This year marks the founding of Variable Stars South (VSS); an organization dedicated to instigating observing and research projects for the benefit of the world wide astronomical community. You're invited to participate. The VSS is a continuation and modernization of the original Variable Star Section of the Royal Astronomical Society of New Zealand, which, along with the American Association of Variable Star Observers in the north, has a decades long history of coordinating the efforts of variable star observers with their professional counterparts.

I have the privilege of being the Visual Research Coordinator appointed by Tom Richards, the new Director. So, the focus below is on visual observing because that's my field; but electronic observers are much loved and needed, too. It will be a little while before we have our own website, so meanwhile anyone interested can go to the VSS page on www.rasnz.org.nz, and the yahoo group AVSON is recommended also for all VSS discussions and communications.



At age eight Alan was given a 50cm telescope for Christmas, and remembers finding the Andromeda galaxy from his back yard in suburban Sydney – a small fuzzy ellipse. However, it was not until after 30 years of armchair astronomy and science fiction that he came back to observing.

On joining the Sydney City SkyWatchers (then the BAA NSW), he was given a very important piece of advice: You will get more from astronomy if you take on a responsibility such as meteor counting, planetary observing, occultations, comet hunting, or observing variable stars. Privileged to be in an Association counting more than one professional astronomer among its number, he was encouraged into active astronomy; in particular, variable star observing.

A musician by trade, Alan is still in the SCS, and is the Visual Research Coordinator for Variable Stars South of the Royal Astronomical Society of New Zealand. As an astronomer he has published in Europe, America, New Zealand, and Australia. Today he lives with his wife Anne and children Lewis and Eugene and Fluffy Bunny at Linden Observatory in the Blue Mountains, and considers himself one of the most fortunate people around.

And here we see Alan along with, perhaps, a couple of future astronomers—with the 30cm telescope with which most of the work is done. A typical visual set up, with binoculars in reserve for bright objects.

Variable stars change brightness; slowly and ponderously, rapidly or explosively, or anywhere in between. The phenomena relate to much, maybe even most, of stellar research, and professional astronomers rely to a large degree on amateur observers. The observation of such stars is the easiest way for the amateur to cooperate and interact with professional astronomers around the world, and do valuable, even unique, research.

You don't necessarily need a dark sky. In fact, the closer you work to your back door the more productive you will be, and work crucial to the profession can be done in twilight or from light polluted sites. I'm fortunate to live under a reasonably dark sky, but to prove this point I recently did an observing session from Sydney Observatory in Australia, in the heart of CBD. Very successful it was, too, and great fun. Here are some highlights from my notes...

The sky looked better than I had hoped. The bright stars of Orion, Canis Major, Puppis, Vela and the Southern Cross were all visible, which was very important because I don't use go-to technology, setting circles, or non-magnifying finders. A 30cm Newtonian Dobson telescope was used with a good finder scope, plus binoculars and charts.

The first target on the list was T Pyxidis. This is a recurrent nova that undergoes a thermonuclear runaway explosion every 19 years or so, but is more than 20 years overdue today. Actually, astronomer Dr. Brad Schaefer predicts it won't go off for another 50 years, but that just makes me keener to observe it. An observation of $<12.5m_v$ (fainter than 12.5 visual magnitude) was logged. If in outburst T Pyx would have been clearly visible, even well before maximum, and the worldwide astronomical community would have been notified at once.

Three of the brighter dwarf novae were observed, although not in outburst. Dwarf novae are binary star systems – as are the 'recurrent' type above – that explosively brighten on a regular basis; sometimes even a week or two apart. Observed were Z Chamaeleontis at $<12.8m_v$, V1159 Orionis at $<13.5m_v$ and HL Canis Majoris at $<13m_v$. These negative observations are useful, because they can define the starting point of the next outburst. The long term monitoring of these systems is not well done by any professional technique at present.

Finding V1159 Ori and HL CMa is a pleasure, with the famous Orion nebula as a finder object for the first, and the star Sirius actually in the eyepiece field for HL CMa. To be honest, that's a nuisance, but Sirius is a beautiful object; like a shining white diamond. And incidentally, the Orion nebula was visible to the naked eye beyond the city skies.

The famous Luminous Blue Variable (LBV) Eta Carinae was observed, along with other LBVs AG Car, V432 Car and S Doradus. These are not super but hypergiants, and are so rare that most are well known by name to variable star observers. Eta Car and AG Car were binocular objects under city lights from far across our Galaxy, and S Dor is so luminous that it's a binocular object from another galaxy, the Large Magellanic Cloud (it was $9.1m_v$ on the night).

V432 Car warrants a special mention. The observation, $11.5m_v$ from the middle of the city, was sent immediately to the University of Brussels in Belgium, to contribute to a professional study of the object involving the European Southern Observatory in Chile, and this observation was later part of a published work (2008A&A...484..463S). Amateurs are often given co-authorship in these papers, and you, too can be part of today's science.

As coordinator for visual research I'd like invite all visual observers to participate in a first research project: the Dual Maxima Mira Project, instigated by Stan Walker of the VSS. These are long period variables that have double peaks in their light curves. Some of these stars are thought to be undergoing evolutionary changes *now*, and are bright enough to observe with binoculars; others are definitely challenging. For more information, please contact me at alan.plummer@varstars.org

We amateurs get paid, too. How? By learning and seeing the sky as few others can do. One can make a point of touring the galaxies, nebulae, clusters, beautiful colored stars, planets, and asteroids along the way while participating in a wonderful science. □

THE LONG PERIOD VARIABLE STARS

Stan Walker, Coordinator, Long Period Variables
Wharemaru Observatory

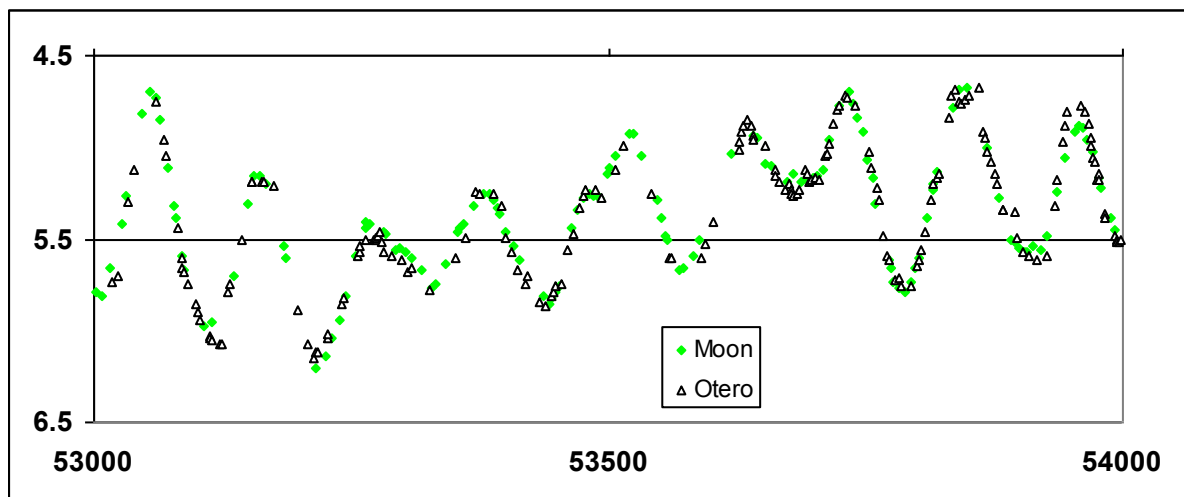
stan.walker@varstars.org

Let me introduce myself as the Coordinator of a section of Variable Stars South with the role of promoting and guiding the observation of the longer period variable stars, Miras, semi-regulars - SRs - and an assorted group of other objects, conveniently called Long Period, or LPVs. These have traditionally been the target area of the visual observer and they make up the bulk of the databases of the RASNZ VSS, the AAVSO and similar groups.

In its new incarnation Variable Stars South will continue to monitor these variables, but for much of the time with specific short term goals in view - not just data collection that we trust someone in the future will use for scientific analysis - but something we can analyse and publish useful ideas about. The original field itself has changed, and will continue to change, as a result of the availability of a wide variety of specialised devices to the amateur. These include photometers such as the SSP4 and SSP5, a wide variety of CCD cameras and even low cost spectrographs. An example of a practical project appears on page 4—L² Puppis which seems to be doing something unusual. Others are also mentioned later.

Theta Apodis

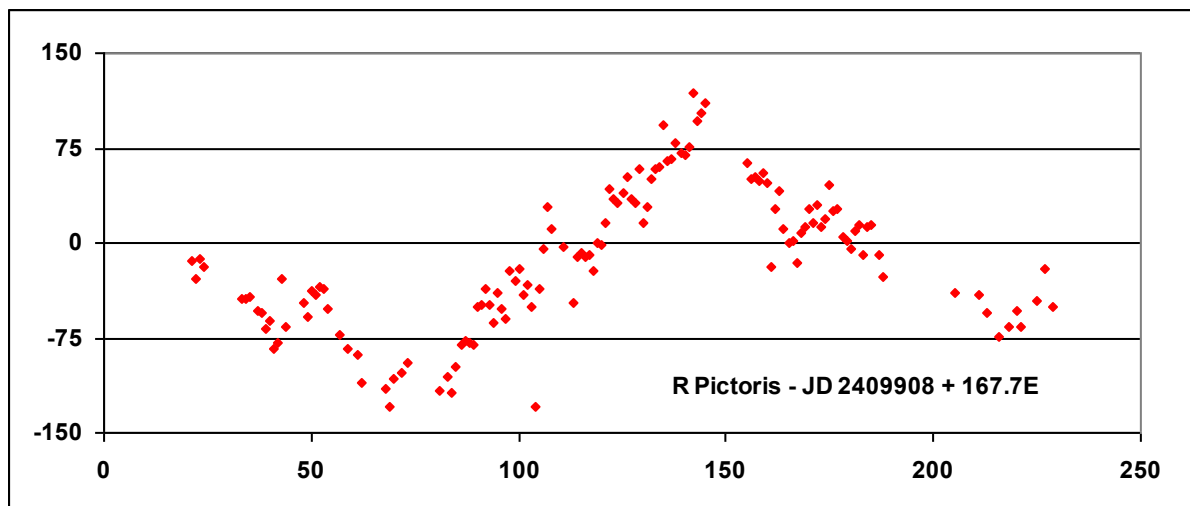
Any observer can now read a wide variety of research papers on the Internet, thus keeping abreast of what is being discovered. Papers can be published in electronic journals, and with effective communications several people widely apart can collaborate on particular projects much more readily. To illustrate this particular point, we present below a graph based on a paper by *Moon, Otero and Kiss, JAAVSO, 36,2007*. This shows Sebastian Otero's visual estimates as triangles, Terry Moon's peV measures as filled diamonds. A small correction of -0.05 magnitudes is needed to align the visual and V measures. Incidentally, this star is too bright for good values from ASAS3!



Otero's results show in a dramatic manner that it is better for a visual observer to concentrate on a small number of stars and observe them intensively, rather than make a few measures of many objects. Naturally, some coordination is required to ensure that no star gets too many, nor too few, measures. But with the Internet, this is easy to achieve as shown by Moon in Adelaide, Kiss in Sydney and Otero in Buenos Aires.

What Should be the Targets?

There have been dramatic changes since 1927. Equipment is better, there are large scale surveys like ASAS3, and we now understand a lot more about some types of star than we did then. But there is still much to do. Whilst ongoing monitoring of Mira stars is needed, I'd like to see some attention paid to physical aspects of these stars, rather than just the periods. Then there is a whole area where very little has been done - mainly the low amplitude, short period semi-regular stars. Many of the longer period SR stars have been traditional targets: T Centauri, theta Apodis, L² Puppis, R Pictoris and similar. But there are numerous low amplitude, shorter period objects which are just as important. The light curve of theta Apodis illustrates what can be done by high precision measures. For the traditionalists, I show an O-C diagram of R Pictoris which has some interesting features.



This shows epochs from JD 2413415-48260 with quite marked deviations from the predicted ephemeris. Cycle numbers at the foot, days early or late vertically. Since then there are 40 unplotted epochs - a nice bit of updating by someone with the time might be rather interesting. Many LPVs show these alternate periods, but they are largely ignored by the theorists. But they must be telling us something about the star - and unless they are taken into account predictions are rather useless.

Elsewhere in this newsletter there is discussion of digital cameras and their possibilities in the VSO field, as well as an interesting comment about other equipment available for loan. Some of this is useful on bright stars, which comprise a much understudied field. Amongst these we find the stars which have the longest history of measures, so there is much more information about their periodicities. It's also an area where the southern sky survey, ASAS, cannot operate effectively due to saturation of the detectors. So if you can get your CCD or digital camera to work reliably in the magnitude range 4–7 there are plenty of targets.

The Initial Projects - Dual Maxima Miras and Phase Lags in LPVs

When I agreed to work with these stars I planned to describe two projects in this Newsletter - a project involving dual maxima Miras and one concerning phase lags in LPV stars, not necessarily Miras. However, the work done by Otero and Moon has encouraged me to delay the second until we have

better information on some of the SR targets - but L² Puppis and QZ Carinae are worthy alternatives! The important aspect of these LPV projects is that we hope to encourage measures over a range of wavelengths. The visual measures will, as is normal, provide the skeleton onto which the other measures are fitted but by extending the wavelength range we hope to produce much more information about what is happening. Observers, when combined, should be able to work at a range of wavelengths. Classical photometers can usually measure UBV, inexpensive CCD cameras can manage VRI and the few SSP4s around can work in JH. So the targets are covered from about 0.35 to 1.65 microns. Beyond 2 microns more specialised equipment and higher altitudes are preferable. The first project is described on page 21.

To avoid filling this Newsletter with technical information there will be additional background to the projects on the VSS website www.varstars.org. This will be updated as necessary and progress noted. The whole purpose of the project driven approach to variable star observations is to get an immediate result if this is possible. The long term goals of the group still apply - after all, it takes ~60,000 years for a Mira star to evolve through that stage and most of us won't be around that long, but we hope to find a few examples of these stars doing something unusual while we're watching. After all, since I've been observing them, BH Crucis has lengthened its period by 25% and R Centauri has decreased by 10% - and both have shown dramatic changes in the shapes of their light curves.

Let's also make this area a two way street. The observers are not people collecting data every five years to see if it warrants a paper - they're the people at the telescope watching what is happening from night to night. So if anything appears unusual let's hear about it. The various periodicities of L² Puppis were noticed because a young observer - Gordon Herdman - wondered why he was getting the same brightness for a week or so at a time in a star which otherwise varied quite quickly. UBV measures at Auckland Observatory confirmed the standstills, but it took the long and extensive dataset of Frank Ives, using a small 76mm refractor, to allow the various periods to be determined. An example of cooperation which we hope to emulate.

Mira, Semi-regular and Long Period Variables in General

Away from the particular and on to the general - what do we know about LPVs at this time? After reading about 500 pages of papers from a wide range of largely professional researchers I'm a little confused. In some ways the ideas seem little changed from the 1970s. Observing has been concentrated mainly upon the Mira stars, which show large variations over a relatively short period, and some of the SR variables - usually those with the more repetitive light curves. So we have quite good light curves from those stars with periods between 90 and 600 days, but not a great deal from the others.

The literature suggests that Mira stars are found in the asymptotic giant branch (AGB) of the HR Diagram and comprise mostly low to medium mass objects which began with less than 10 solar masses. So this represents a bottleneck or choke point through which most single stars pass late in their lives. The L stars, which are less intensively observed (not many have the patience to look at a low amplitude variable with a period of 1000 days or so) are probably much more massive. Harry Williams made a few UBV measures of Betelgeuse and Antares but gave up for these reasons. At the short period end there are many stars which are known to be variable and are often called SR although they have little or no regularity in the pulsations, and the light variations are so small that they require intensive PE or CCD observations to record them. It's probably more realistic to use Olin Eggen's acronym - SARVs, small amplitude red variables, for these. But there are a few very regular stars which are rewarding.

Many of the recent analyses of cool variables concentrate on the infra-red and near infra-red regions. The idea is that it's more sensible to measure stars whose radiation is at these wavelengths with filters

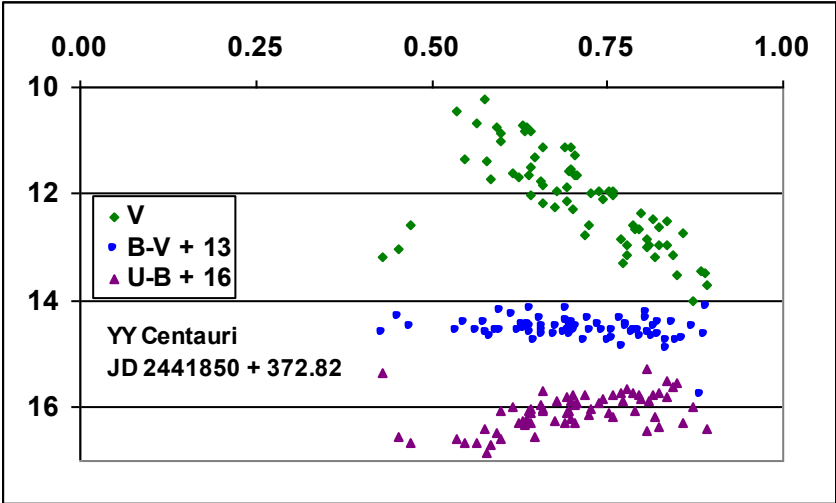
that transmit this. But it may well be that many of these measures are mainly of the dust shells surrounding the object and the results may lead to confusion. One is reminded of nova observations and models of the first half of the last century which produced a tremendous amount of information about the consequences of the event - but it was the realisation of the interaction of the cataclysmic variable pair, the structure of the white dwarf star and the nuclear processes occurring which led to the understanding of the nova event itself. Much the same applies to the LPV scene - after all, it is the star itself which is pulsating and producing the shocks which drive the events. Stars are the main engines by which our galaxy evolves. So, get out there and make some observations!

And in Conclusion of this Introduction

We'll all make much more progress and enjoy it more if ideas are exchanged. This section has been a bit of a ramble as we're trying to set the scene for what seems to be worth observing in the LPV field. Above I commented that you observers are the ones that find the interesting stars - so let's know of any that you come across. I'm quite happy to use JD/Magnitude files to make graphs so you don't need to waste observing time in drawing it all out.

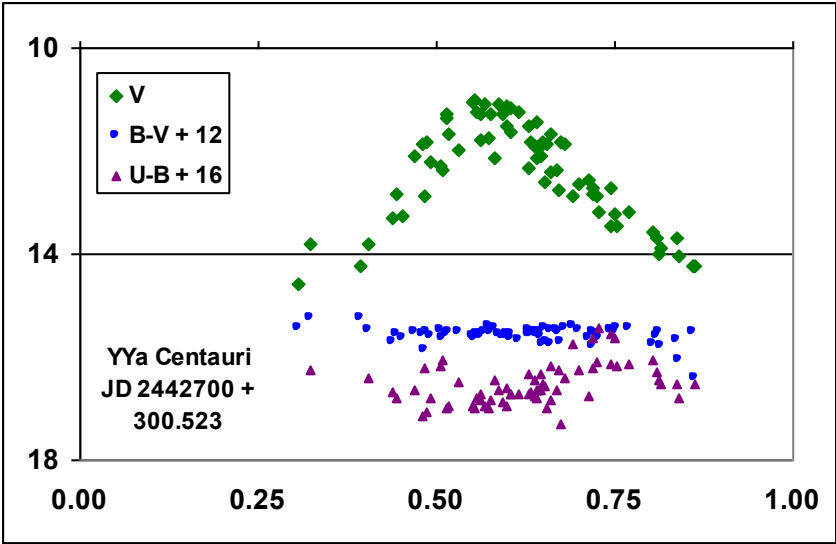
YY CENTAURI AND ITS NEIGHBOUR

A long time ago the RASNZ VSS lost YY Centauri. It wasn't really lost, it was just that the period of 372 days tended to make it rather low for observing each season when it was bright. So with PEP being able to sort out variables from the field on account of the colours we were called in to help. No



trouble, a star with suitable colours was quickly found and it was variable.

However, then someone found the real YY Centauri, more or less where it was supposed to be and we had a spare star—which we called YYa at Auckland Observatory. Just another Mira, so we didn't get excited, and I don't even know whether it's been listed in the GCVS as yet.

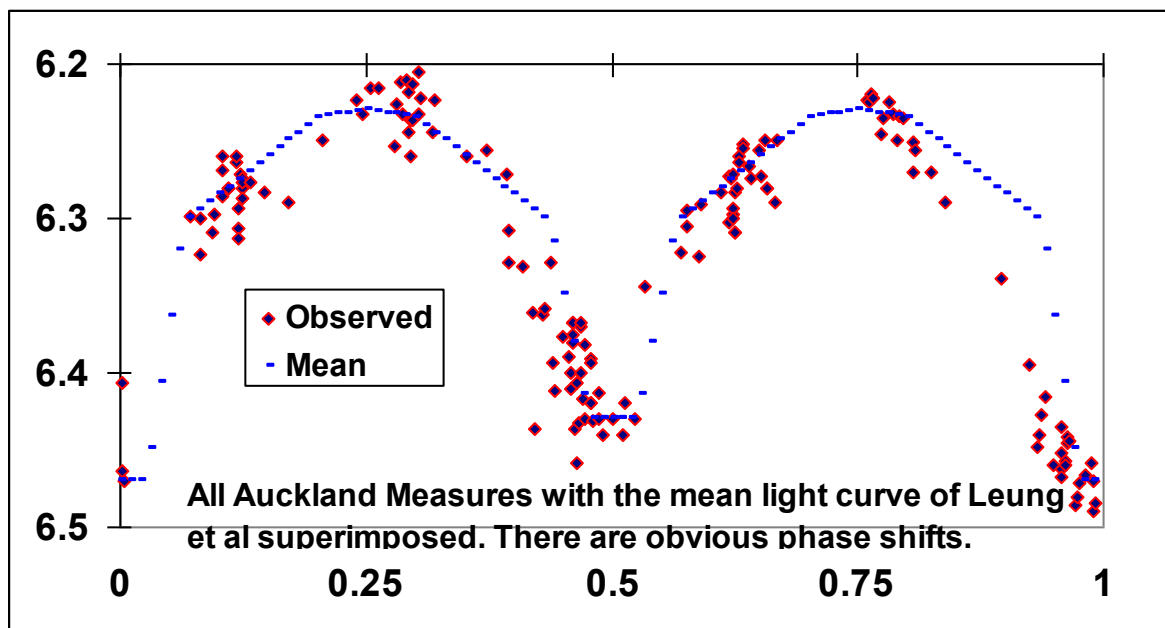


The panels show light and colour curves for both stars and anyone interested in observing these should look at VSS chart 449. Epochs are arbitrary. Both are typical Mira curves—some irregularity in amplitude, little B-V change, and U-B brightening a little as the stars fade, due to the emission lines remaining strong at the start of the decline.

QZ CARINAE—CCD AND PEP V MEASURES NEEDED

Stan Walker

One of the most difficult observing targets in our galaxy is QZ Carinae, a massive EB system. It comprises four stars arranged in two pairs: an eclipsing pair with a period of 5.99875 days and a non-eclipsing pair with a period of 20.74 days. Masses are 16.7 and 28.0, and ~ 40.0 and ~ 9.0 respectively. Separation of the two pairs is about 50 AU and the absolute luminosity about -7.5 . It's almost naked eye at 2500 parsecs! The illustration below shows the mean light curve established from the first 61 measures over two seasons at Auckland Observatory. Superimposed on this are further measures made at Auckland and Kaitaia over the intervening 30+ years. (I think this timescale justifies the LPV coordinator being interested in an EB). Many different measures have been used—Hipparcos, ASAS3, measures by Mayers' group and others to arrive at a picture which I'll discuss below.



Eclipses travel slowly eastward and at present are best observed from Australia and New Zealand. By 2012 they will be out in the Pacific! Conventional eclipse timings are not reliable as they are distorted by the orbital light variations of the non-eclipsing pair. The central eclipse also shows light time variations of at least ± 7.2 hours over a period of 30 years or more. This accounts for the phase shifts. What we'd like to do, and Terry Moon of Adelaide and Tom Richards of Melbourne are our first two collaborators, is to disentangle the assorted light variations and establish:

- The size in AU and period of the orbit of the two pairs of stars.
- The true period of the eclipsing pair with the light time effects removed
- The period of the non-eclipsing pair and its light curve

How do we do this? The out of eclipse light variations comprise aspect variations of the eclipsing pair with an amplitude of ~ 0.1 magnitudes—and similar variations, but eccentric, of the non-eclipsing pair with an amplitude of 0.03–0.05. We need about a hundred good V measures outside of eclipses to establish the last of these. By determining the epoch and exact period these 'distortions' can then be removed from the light curve of the eclipsing pair and a seasonal epoch produced. Added to the O-C diagram of eclipse epochs this will hopefully show that the system has reached and passed the maximum positive displacement, thus providing an amplitude for the light time effects and a better diameter of the overall system. A dozen or so measures during eclipse, but away from the totality phases, will allow the determination of the epoch in 2009. Both CCD and PEP V measures are wanted, but it's not a visual target. Comparison stars appear on the website www.varstars.org as well as a review to date—even if you don't observe have a look at the background to this very interesting star.



DIGITAL SLR DIFFERENTIAL PHOTOMETRY

Des Loughney EB Secretary BAA VSS

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Introduction

In recent years it has been found that digital SLR's are capable of accurate unfiltered photometry as well as V filter photometry. Undriven cameras, with appropriate lenses, can do photometry down to magnitude 10. Driven cameras, using exposures of up to 30 seconds, can allow photometry down to magnitude 12. The cameras are not as sensitive and as accurate as CCDs primarily because they are not cooled. However, they have their advantages because their fields of view are relatively large. This makes variables easy to find and an image can sometimes incorporate several stars of interest. Also, the cameras can be used to analyse bright stars.

With experience the 'turnaround' in producing an accurate estimate can be quick as we are using a backyard setup that may not require a driven mount. At the moment I can arrive at an accurate V estimate for epsilon Aurigae in fifteen minutes. This time includes taking twenty 5 second images and then analysis of the images on the computer. An unfiltered estimate can be done in under ten minutes. It is commonly accepted that visual estimates have a standard error of plus or minus 0.1 magnitude. DSLR estimates are much superior to visual estimates though they will obviously not replace them because they require more equipment and time. With care and in good conditions the estimates using a DSLR can be done to plus or minus 0.02 magnitude. If the highest possible accuracy was of importance then estimates can even be improved by analysing more images - perhaps 30 within a five minute period.

For studying eclipsing binaries in order to make estimates of mid eclipse and then the current period of the system the greater accuracy of a DSLR compared with visual enables easier and better calculations of the time of mideclipse. Another advantage of DSLR observations compared with visual is that the images can be archived.

Equipment

I use a Canon 350D DSLR. It came as a package that included a zoom lens which works very well for everyday photography but is not suitable for photometry because the aperture is too small. The lens does not collect enough light for star photometry. In practice I use two excellent Canon lens of fixed focal length. One is the 85 mm f1.8 lens which has an aperture of 52 mm. This allows undriven photometry down to magnitude 8. The second is the 200 mm f2.8 lens which has an aperture of 72 mm which allows undriven photometry down to about magnitude 10. The camera and lens are mounted on a sturdy tripod. I have to use a remote switch to prevent camera shake given the length of exposures.

The images of the target variable star are interpreted on a PC using the software package AIP4WIN version 2. This programme opens the RAW images produced by a Canon camera which can then be analysed using the programme's photometric tools. The process of analysing is speeded up if a modern, fast, PC is used. I currently use a Dell laptop - Latitude D630 - which is very satisfactory. It will be noted that photometry using a DSLR is not a low cost option. However, all the equipment has other uses. The camera and the lenses can be used, for example, in pursuit of quality wildlife photography. And every home in the twentyfirst century needs a computer!

Methodology

Through experience it has been found that accuracy is severely affected by windy conditions which vibrate the camera and tripod - and by atmospheric turbulence and light pollution when the target stars are less than 30 degrees above the horizon. Ideally, if it is a practical option, images are made



' Des Loughney resides in suburban Edinburgh, Scotland, at 56 North and 3 West. He is a backyard amateur astronomer. Being on the east side of Scotland and in something of a rain shadow he enjoys observing variable stars on 30% of nights. He is a visual observer using 10*50 binoculars and a 200 mm reflector. He also practices DSLR photometry on a variety of variables specialising in eclipsing binaries. He has a particular fascination

with contact binaries and enjoys observing them over two month periods to construct detailed light curves. Nearing retirement from full time working he is looking forward to full time astronomy! '

when the target star is above 60 degrees. With these qualifications I can arrive at a reasonable accuracy from a suburban setting. A dark sky site is not a necessity. Better images result if the camera and lens can reach thermal equilibrium with the outside environment. I try to put the camera out for 20 or 30 minutes before imaging.

Alongside the software is '*The Handbook of Astronomical Image Processing*' by Richard Berry and James Burnell. A study of this book suggests the right way to go about acquiring quality images. The suggestions have been confirmed by experiments. The images have to be in a RAW format. The jpeg format does not retain enough information. A reasonable estimate needs at least ten images. If accuracy is very important then twenty or thirty images may be necessary. A master dark frame has to be constructed to be subtracted from each image to eliminate background noise. A master dark frame is made from ten dark images. These are images taken with the camera capped and stacked with AIP4WIN. A separate master dark frame is required for each exposure used. I use sets of dark frames for a week or two and then change them as the outside environment either warms or cools. In theory it is advisable to also construct master flat field frames in order to remove the effects of the edge distortions of the lens. I have found, however, that the field of view of a DSLR is so wide that a flat field is not required provided the target star and comparison are in or near the centre of the field of view.

A lot of thought has to go into a suitable comparison star(s) as only one or two are required. The comparison stars may already be suggested by a standard chart for visual observations. I always check the possible comparisons with the Hipparchos Catalogue to ensure that it really is unvariable or has a variation within plus or minus 0.01 magnitude. I assume that the correct magnitude of the comparison is the V magnitude quoted in the Catalogue to one hundredth of a magnitude. I am currently experimenting, using the AIP4WIN software, with the photometric analysis of sum stacked images which seems to allow photometry with undriven images down to magnitude 10 with the 85 mm lens (5 seconds exposure) and magnitude 11 with the 200 mm lens (2.5 second exposure).

Settings

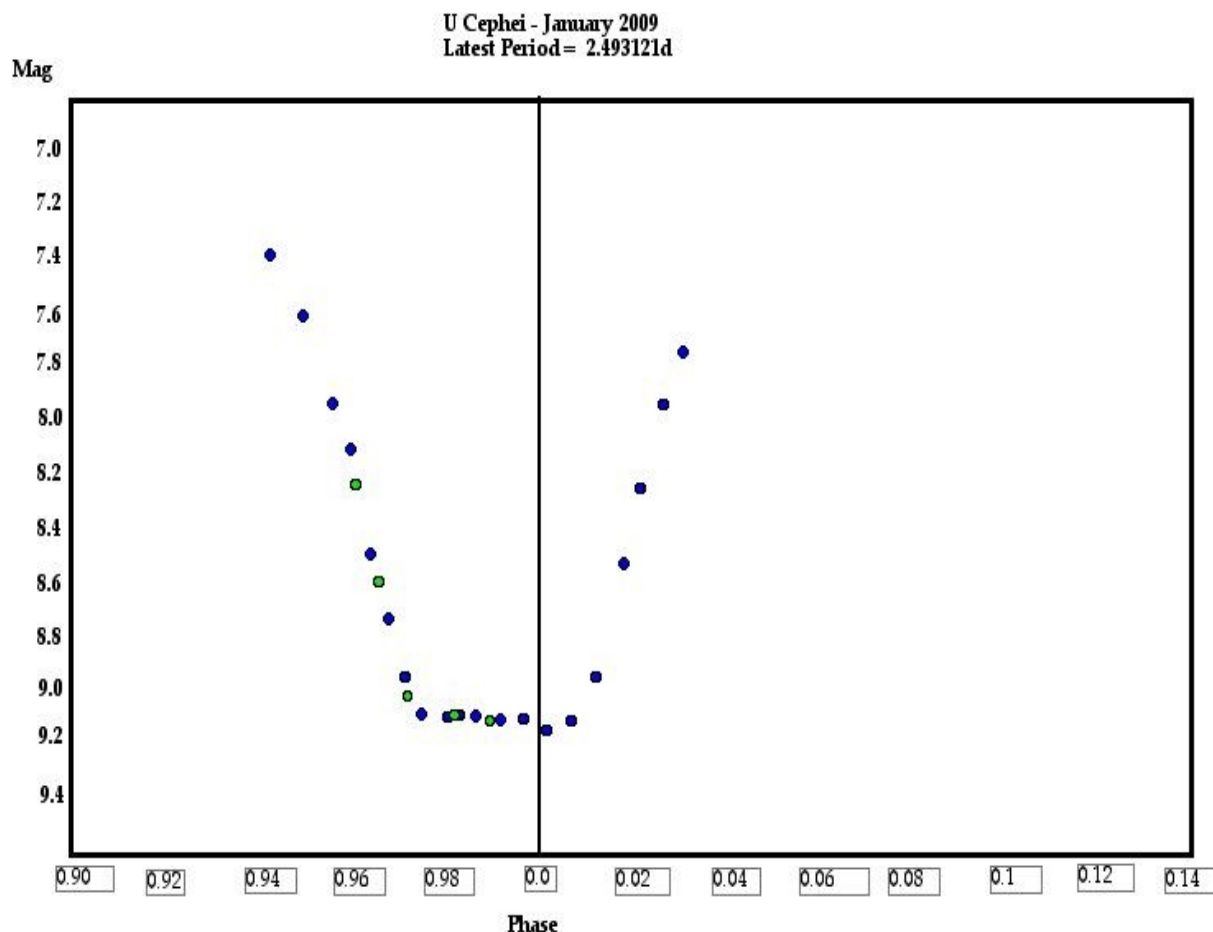
For satisfactory results it is vital to get a good signal to noise ratio in the images. This means that the camera settings have to be adjusted to get the best result as regards the target star and comparison. I have spent a lot of time on experiments to find the best settings. For studying a star such as rho Cas (SRd, 4.1m to 6.2m) I use, with a 85mm lens the settings of ISO800, f3.5 and an exposure of 5 seconds. For epsilon Aurigae (around 3—4 magnitude) I use, with a 85 mm lens, settings of ISO200, f4.5 and an exposure of 5 seconds. For the eclipsing binary U Cep, which fades to a magnitude of around 9.1, I use, with a 200mm lens, the settings of ISO800, f 2.8 and an exposure of 3.2 seconds.

The maximum exposure possible with an undriven camera (to avoid unacceptable blurring) using the 85 mm lens is 6 seconds unless you are near the pole star when longer exposures are possible. As a general principle it is best to go for the longest possible exposure as reducing the impact of scintillation produces markedly better results. The maximum exposure with the 200 mm lens is 2.5 seconds though this can be increased near the pole.

If I am following the fade of an eclipsing binary over a range of more than one and half magnitudes it may be necessary to change the settings in order to catch more light. For example, the settings may be reduced by one or two stops. To avoid unacceptable blurring the images should be in sharp focus. Special care has to be taken to ensure that this is the case as the point on the lens for an infinity setting will vary as the lens expands or contracts in response to the ambient temperature.

V Photometry

The light receiving chip within the DSLR is covered by an array of pixels which are individually covered by green, blue and red filters. This allows high quality colour photography. The software that comes with the camera combined with AIP4WIN enables you to separate and analyse the light that



solely arrives through the green filters. The software produces what it calls a 'green channel image'. This image can be analysed with AIP4WIN's photometric tools.

It turns out that the standard green filter used in Canon cameras is approximately equivalent to the Johnson V filter. To convert the estimates from green channel analysis to professional level V estimates one has to use a transformation co-efficient (TC). This worked out empirically for each camera model by comparing the estimates of unvarying stars taking into account the difference in (B-V) between the unvarying stars. I am at present making, as part of an international campaign, V estimates of epsilon Aurigae. My V estimates seem to be reliably within 0.01 or 0.02 magnitudes of professional estimates.

Results

The above method is a useful backyard method, suitable for amateur astronomers, of differential photometry which is a lot more accurate than visual estimates and can be, with care, as nearly accurate as professional methods. It can be used on brighter stars. Without a telescope and a drive a wide range of stars down to magnitude 12 can be studied. The set up is robust and easily transported. With experience the time spent in acquiring ten images and producing an estimate can be less than ten minutes.

I find the method particularly useful for constructing good light curves of eclipsing binaries, cepheids and irregular variables. The increased accuracy can make a surprising difference to the quality of a light curve. I have been able to get reasonable light curves of an eclipsing binary when the total variation is just 0.2 magnitudes.

Example

The figure shows recent estimates (January 2009) of the eclipsing binary U Cephei using this method of photometry. The figure presents a light curve of estimates on three different nights. The estimates have been combined in a phase diagram. Each point on the figure represents the average magnitude after an analysis of ten images. Each estimate is classed as unfiltered and are not V estimates. There is no necessity to do V estimates when the object is to study the mid point of an eclipse.

The current stated period of U Cephei, which varies in eclipse from 6.7 to 9.2, is 2.493121 days. If this period is correct then the mid point of the eclipse should have coincided with the vertical line. It can be seen that the midpoint is earlier than the predicted time. After a correction to take account of heliocentric time it was worked out that the eclipse was about 30 minutes early which corresponds to a new period of 2.493086 days. It can be seen that the methodology produces a nice light curve which is

DIGITAL CAMERA PHOTOMETRY SOUTH OF THE EQUATOR

We'd be interested in hearing from anyone who may actually be doing this at the moment. Or who has used any form of available software for reducing the images. There is a small group in Northland, NZ, who are experimenting with this—using rather smaller cameras than Des, but then there are many bright variables about which we know very little—except that they seem to vary and are mostly red stars.

We hope to have some positive reports by the May issue from actual experience, but if anyone else has made progress in this are, let's know.

MULTICOLOUR MEASURES OF MIRA STARS WITH DUAL MAXIMA

Objectives: Determining the colour changes and light curves for a complete cycle of selected Mira and Semi-Regular stars which show two discrete maxima during each cycle. Other similar stars with distinct and regular bumps on the light curves may be included. For background see www.varstars.org

EQUIPMENT AND FILTERS:

The skeleton against which the colour measures will be fitted will comprise standard visual observations. Colour systems will include UBV, VRI and JH. Single filter V measures will be accepted if offered.

OBSERVING REQUIREMENTS:

We wish to obtain the following measures each cycle:

Visual	100 per star, or about one each 5 days.
UBV VRI, JH	50 per star, about each 10 days

A slight oversupply of measures around each maximum would probably be useful on the stars reaching maximum early so that we can evaluate the suitability of this scale. For the stars with low amplitudes, visual observers should preferably be quite experienced.

TIME FRAME OF PROJECT:

As most of the target stars have periods of between 400 and 600 days this project will extend to 31 December, 2010. Progressive results will be published in the Quarterly Newsletters and the website. Two of the stars, BH Crucis and R Centauri, seem in an active evolutionary state and might well be followed after that. They certainly should be reobserved at a further ten year interval.

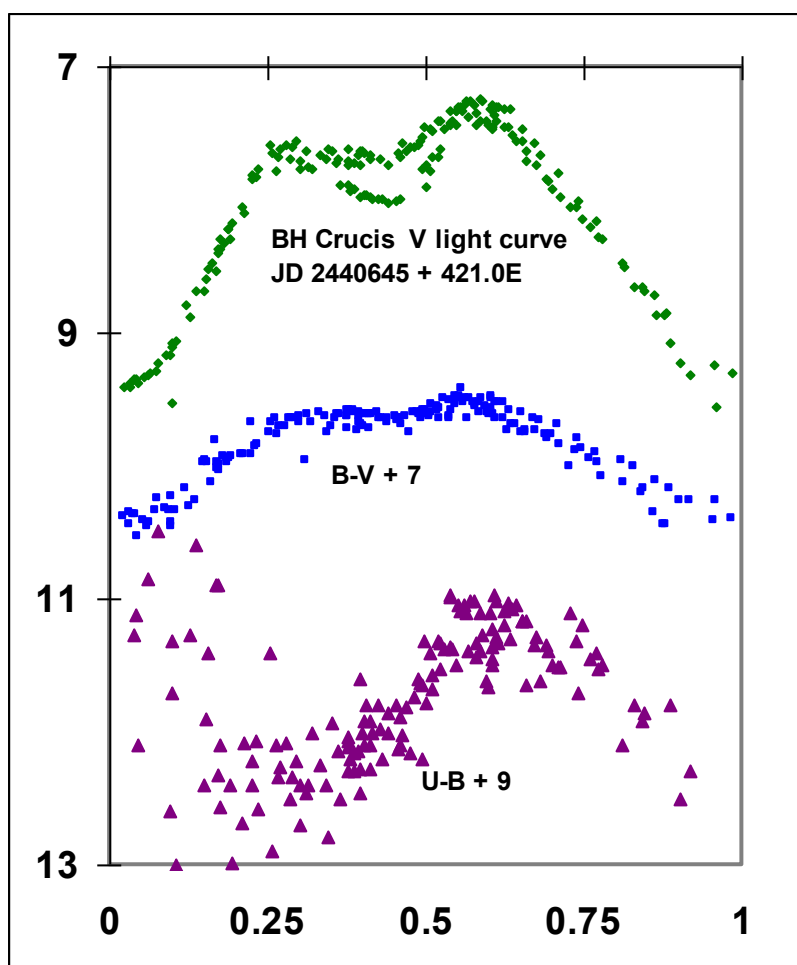
PUBLICATION OF RESULTS:

This will be done in early 2011 in an approved Journal

TARGET STARS:

There are eleven stars on the preliminary target list. These may be changed if they appear after several months' measures to be unsuitable. This list appears below. They all lie close to the galactic plane, as evidenced by the B^o column. It has been suggested that these stars form a single small population, being found in such a small part of the sky. But if you know of others, let us know.

Star	R.A.	Dec.	Max	Min	Period	Type	B ^o
NSV 4721	10 03 30	-46 49.2	9.6	11.8	410~	Mira	?
BH Crucis	12 16 17	-56 17.2	6.5	9.8	530:	Mira	6.25
R Centauri	14 16 34	-59 54.8	5.8	9.0	500:	Mira	1.21
R Normae	15 35 57	-49 30.5	6.4	12.0	507	Mira	5.08
BX Carinae	10 52 06	-62 29.0	11.7	13.8	427	SRa	-2.74
TT Centauri	13 19 35	-60 46.7	9.0	13.4	462	Mira	1.90
UZ Circini	14 20 52	-67 30.8	9.2	14.0	538	Mira	-6.12
BN Scorpii	17 50 51	-34 20.0	11.0	15?	616	Mira	-4.33
FK Puppis	08 07 19	-36 08.3	8.0	9.5	502	SR	-1.78
CK Carinae	10 24 25	-60 11.5	7.2	8.2	525	SRc	-2.36
CL Carinae	10 54 00	-61 05.6	8.0	9.0	513	SRc	-1.39



This graph shows some multicolour photometry of BH Crucis in the 1970s when it was a true double maxima Mira star. The V light curve is self explanatory and shows an amplitude of around 2.5 magnitudes. B-V is normally a temperature indicator and varied between 2.5 and 4.0, which is very red. The star itself showed a confusing spectrum, being part way between S and C and somewhat variable. The U-B colour curve is very noisy, but at minimum the star is ~17 in the U filter, a bit faint even for a half metre telescope. But there is obviously a large colour change there. In contrast, R Centauri's light curve—see website— shows a higher temperature in the first maximum. These inconsistencies are part of the puzzle that our measures may resolve.

STARS FOR MARCH to MAY, 2009

We present a list of Mira and other long period variables in the Southern Hemisphere reaching maximum or faint minimum during March, April and May. This is based upon AAVSO predictions in Bulletin 72. Listed below are LPV stars with average minima of magnitude 14 or fainter. Observations at these levels are always welcome—so those with big telescopes could give these special attention. Maxima are listed on the next page. An asterisk denotes an AAVSO chart—see VSP.

Name	Minimum	Date	Chart	Name	Minimum	Date	Chart
S Cet	14.2	April 4	*	X Sco	14.3	April 22	*
X Scl	<14.2	March 18	59	W Sco	14.6	May 30	*
U Tuc	14.1	April 16	348	RW Sco	15.0	March 25	239-40
U Hor	<14.0	March 13	268	RV Sgr	14.1	May 6	341-2,1050
X Lep	15.6	March 27	*	W Aql	14.0	March 23	*
SY CMa	14.2	March 2	326-7,986	TY Sgr	15.0	March 9	39
TU Hya	<15.5	March 16	*	S Sgr	14.8	March 16	*
ST Hya	14.5	May 18	620-1	Z Sgr	16.0	April 30	*
Z Vel	14.3	April 17	64-5	W Aqr	14.2	April 5	*
RU Hya	14.0	May 6	*	R Ind	14.3	March 21	231-2
RT Lib	14.3	May 8	*	V Phe	14.0	April 15	515-6
U Lib	14.4	April 27	*	W Lib	15.0	June 4	*
R Lib	14.8	March 22	*				

STARS FOR MARCH to MAY, 2009 (Continued)

Listed below are those stars with maximum occurring in the February-March quarter. Note that the predictions are based upon past performance and may be out by up to 10-20 days. The brightness is also averaged, so they may be brighter or fainter. That's what observing is about!

Name	Max	Date	Chart	Name	Max	Date	Chart
V Scl	9.9	March 17	60,434	RR Vir	11.6	April 19	*
S Tuc	9.3	April 30	62-3	Z Vir	10.4	March 2	*
T Phe	9.4	March 19	74-5,1218	T Lib	10.9	March 4	*
Z Cet	8.9	May 17	*	X Lib	11.0	March 28	*
RS Phe	9.7	May 2	435	R Lup	10.1	March 19	*
R Cet	8.1	March 21	*	RR Lib	8.6	April 1	*
X Cet	8.8	March 29	*	RZ Sco	8.8	March 27	882-3
U Eri	9.4	Mar 13	*	R Sco	10.4	May 12	*
W Eri	8.6	May 29	*	S Sco	10.5	May 9	*
T Eri	8.0	May 4	*	W Oph	9.9	April 14	*
SX Eri	9.6	April 30	1181-2	V Oph	7.5	March 17	*
T Col	7.5	March 15	132-3	Z Sco	9.2	May 24	*
S Ori	8.4	April 8	*	Y Sco	11.3	April 9	*
S Col	9.3	March 15	336	RS Sco	7.0	March 24	7
V Mon	7.0	May 24	*	RR Sco	5.9	March 12	5,6
SY Mon	7.3	April 10	*	R Oph	7.6	April 23	*
X Mon	7.4	April 4	*	S Oct	8.4	May 15	656-7
Z Pup	8.1	March 6	*	SV Sco	9.8	May 10	35
S Vol	8.6	April 18	272	R Pav	8.5	May 23	501
W Pup	8.4	March 25	142-3	R Cap	10.6	March 9	*
TU Pup	9.9	March 11	274	W Cap	11.7	March 23	509-10
T Hya	7.8	April 20	*	Z Aql	9.0	March 5	*
R Car	4.6	March 22	1	U Mic	8.8	April 20	223-4
X Hya	8.4	March 9	*	RU Cap	9.7	March 16	*
RS Hya	10.0	March 17	289	Y Aqr	9.4	April 14	*
U Crt	9.0	May 25	*	RY Mic	9.7	March 22	213-4
RS Cen	8.6	April 18	174	T Oct	9.5	March 8	216-7
Y Vir	9.4	April 13	*	Z Cap	9.5	March 11	*
U Cen	8.2	March 18	119,121-2	T Cap	9.5	April 24	*
U Crv	9.6	March 16	*	Y Cap	11.6	March 17	*
U Oct	7.9	March 17	343	R Gru	8.3	May 18	203
T Cen	5.5	April 21	4	T Gru	8.6	April 4	27
T Aps	9.1	May 6	723-4	V Cet	9.4	April 26	*
				R Tuc	9.8	March 10	235-6

VSP is the variable star plotter on the AAVSO website <http://www.aavso.org/>



MIRAS NEEDING ATTENTION

S ORIONIS

This star has a variable period and would be expected to be similar to those which alternate between two values around a mean period. However, the spread of GCVS periods - from 407.10 to 438.53 is abnormally large. During the period 53200 to 54800 ASAS3 has it as 433.33 days, but three maxima were not observed. The star also has a pronounced standstill on the rise, although this is close to the level where ASAS has problems with a close companion star. Next maximum - April 11.

KN HYDRAE

KN Hydrae is listed in the GCVS as a Mira star without an epoch or period, varying from 8.5 - 11.0 photographic. An inspection of ASAS3 measures shows that the period and epoch are JD 2451648 + 267.0, but the brightness varies from 8.7 to 10.8. Possibly the values quoted in the GCVS are not photographic (the star should appear 1.5 to 2.0 magnitudes brighter visually) or the film was panchromatic. However, the light curve is very erratic, with a pronounced hump on the rise. It's more probably a semi-regular star. Maxima on January 20 and October 14.

Z PUPPIS

ASAS3 shows this star with a spectacularly sharp rise to maximum from a flat maximum at 10.8. However, the GCVS shows minimum at 15.2 in V so there's obviously some confusion. Guide 8 shows another nearby star about 12" to the NE which it calls Z as well, and this is quite common due to different positions being quoted for variable stars. No mention of a companion in the GCVS, but a variable period is assigned to Z. Perhaps someone could comment? Is Guide's other star real? Maximum 17 March. Since writing this Stephen Hovell has checked with Simbad and the AAVSO VSP and concludes that ASAS3 data is attracted to the 10.8 star to the NE. So here's another star to follow through minima.

RZ CORONAE AUSTRALIS

The GCVS shows this star with a period of 460: days. The period derived from ASAS3 is 280.56 days and this looks fairly stable at present. The relationship is close to 2:3 so maybe the GCVS value was determined very crudely. The epoch dates to 1927. Maxima on 25 February and 10 December. Apart from ASAS I couldn't find any measures, neither VSS nor recent AAVSO - quite surprising as it's not particularly faint, with maxima at ~9.0. Anyone know anything about it?

Z SAGITTARII

Z Sagittarii is a fairly normal Mira with a period of 450.41 days and an amplitude of 7.6 magnitudes, 8.4-16.0, according to the GCVS. Recently, I checked this star with ASAS3 as part of an ongoing search for interesting objects. I noticed that the maxima had become very erratic with the last seven as 10.2, 8.3, 10.6, not observed, 10.4?, 8.5, 10.3 about JD 2454700. Randal kindly supplied me with visual measures from the archives which showed measures from about 47000 onward - nine maxima, with some variation between 8.5 and maybe 9.5, but nothing like the ASAS data. The long period lies in the more unstable region and the variation in amplitude may indicate that a period change or some other variation may be imminent. Or the star may just be having fun. It's just emerging from the Sun in February and maximum is not until 15 November, 2009, but it may be worth watching visually - even a few colour measures, perhaps? We appreciate that it's getting close to the sun at that stage, but it's possible.

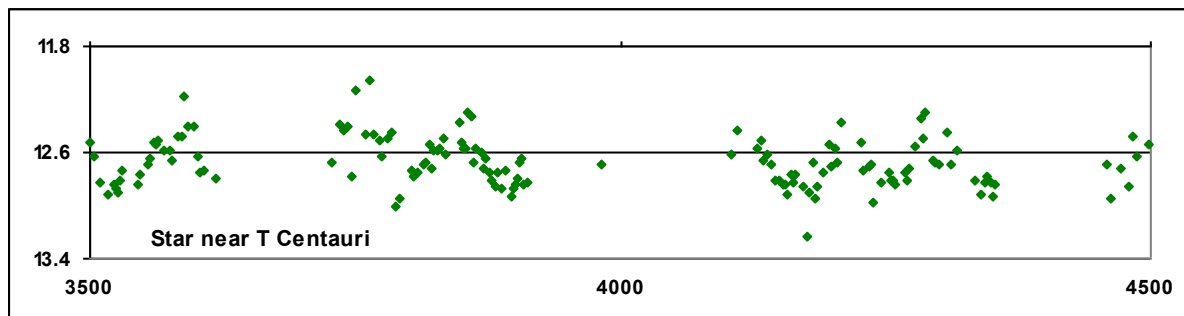
Y AQUARI

Nothing unusual about this star - except that the period of 384 days means that there's little data on its

maxima recently. This is predicted for May 2 so try to do a bit with it before then. It should be observable visually from March, but ASAS will have twilight problems still.

T CENTAURI & GSC 7270 1843

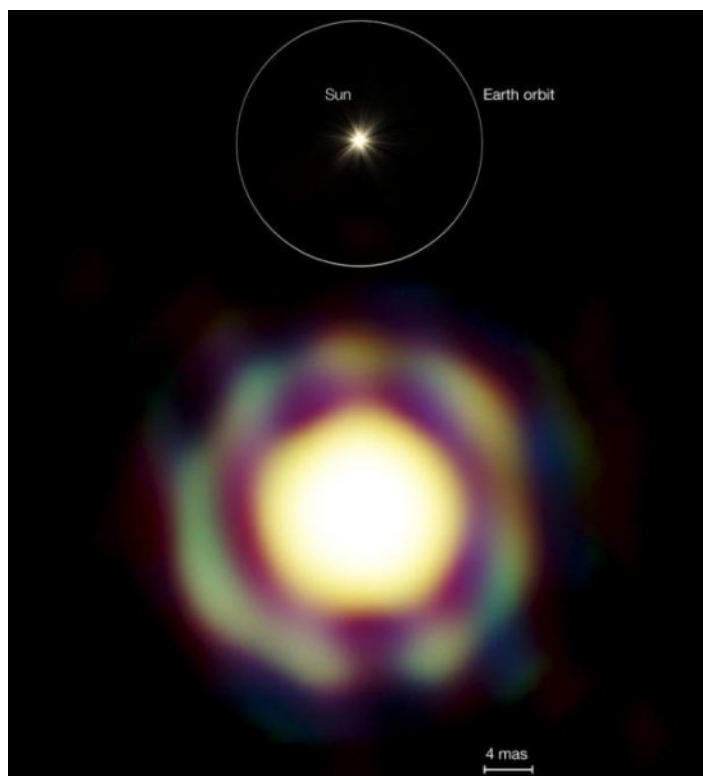
Whilst collecting an ASAS3 light curve of T Centauri I noticed that another star nearby showed small repetitive light variations. When these were analysed they showed several periodicities: the main period was 91.196 days with a range of 12.0 to 13.0, but there were two other periods in the data, 120.5 days and a possible period at 165 days. Obviously a faint semi-regular star of no great interest, but why hasn't it been noted earlier? Using the 165 day period as the base the others are 73% and 55%, fairly common amongst these stars and similar ratios to L² Puppis. But there aren't all that many measures available and these periods may not all be real. Now Albert, tell me you saw this in 1940! And T Centauri, well it's now, early 2009, going through a period of low amplitude variations from 6.2-7.2, justifying its semi-regular status.



R LEPORIS

Many beginners like this Mira star although its long period and somewhat erratic light curve dissuade a few. But recently it's been the subject of some specialised photography at the ESO at La Serena in Chile. The picture below, along with other background information, appears on <http://simostronomy.blogspot.com/2009/02/big-eyes-on-big-star.html>. The diameters of Mira stars have been the subject of some attention recently with satellite measures trying to determine these.

Recently, a team of French astronomers using ESO's Very Large Telescope Interferometer have produced an interesting image of this star. This appears to show R Lep with a diameter of ~150 solar ra-



dii and a shell of twice that dimension. The sizes of all LPV stars, including Miras, are difficult to determine for reasons which are clearly apparent in this picture—where does the star stop and the shell begin? But could we imagine this a few decades ago?

The GCVS describes R Leporis as a Mira stars with a range from 5.5-11.7 over a period of 427 days. It has a strong carbon spectrum, C7,6e. Turning to ASAS3 we notice a variation of maximum amplitude of 2.0 magnitudes over the last four maxima, a rather erratic light curve with humps at times, and a period over the past five maxima of 445 days. Maximum was a month or two ago, so we won't see one until late 2009 at the earliest.



Join Variable Stars South

VSS aims to be an organization for southern variable star observers and researchers (which doesn't mean you have to live south of the line!), bringing them together in close communication to discuss and carry out research on southern variable stars. Whether you are observing visually or electronically, whether your interest is observing or desk research, VSS needs you!

As a VSS member you will be able (indeed expected) to partake in its projects, in the manner that suits best your equipment, interests, skills and situation. As a member of an essentially online organization, you will have access to its online communications (egroups, blogs, forums); and in the Projects you sign up for, you will have very interactive data input, access and manipulation. You will have access to all internal documentation such as guides, work-in-progress documents, and research support documentation. You will be able to help run individual projects, and indeed whole Programme areas with the Coordinator. You will be able to set up and run collaborative projects (but so will qualified non-members who want us to help their research). You will be able to be involved in paper preparation and authoring. You will be able to help shape and implement VSS activities, plans and policy, including the all-important area of Information and Communications Technology including our Varstars website. You will be eligible to borrow VSS equipment.

To join VSS you do not need to be a member of RASNZ. You can sign up as an Ordinary Member (NZ\$20 p.a.). Or support the startup of VSS as a Foundation Member (NZ\$50 this year if you join by the end of the RASNZ Conference, 24/5/09, then the same as Ordinary Membership.) Foundation Members will be helping greatly in setup costs, and will be known forever afterwards as Foundation Members, as a badge of distinction and a thank-you. The current Membership Year expires on 30th April, 2010, then annually on 30th April. So if you join now you get longer for your fee, and are able to have a big input into these early months of setting up VSS.

You can join up online or postally. To join postally, please fill in the form below, and post it with a cheque or bank draft for your fee (NZ\$ please), to Stan Walker, PO Box 173, Awanui 0451, NZ.

To join online, please email a filled-in image of this form as an attachment to accounts@varstars.org. Or of course, just type the information requested into the body of the email. You will then receive an email from Paypal requesting payment by Visa, Mastercard or transfer from your bank. You simply click the Paypal icon in that email to enter their online secure payment facility, and it's all done.

Membership Application Form Variable Stars South

First Name		Surname	
Mailing Address			
City/Suburb		State	
Country		Postcode	
Email Address			
Type of Membership (tick one)	Ordinary (20 NZD)		
	Foundation (50 NZD)		



COLLOQUIUM ON STUDYING SOUTHERN VARIABLES

A colloquium on "Studying Southern Variables" will be held prior to the 2009 RASNZ Annual Conference in Wellington on Friday 22 May 2009 commencing at 10:30am and concluding at 5:30pm. The colloquium will consider the science of observing and studying variable stars visually, photoelectrically and with CCD cameras.

The colloquium will be organised by Bill Allen, Vintage Lane Observatory, Blenheim; Tom Richards, Woodridge Observatory, Melbourne; and Stan Walker, Wharemaru Observatory, Awanui; who are experienced variable star observers. While we expect many very interesting presentations from the CCD and PEP fields, one of our objectives is to encourage visual observations, a field which is very important over the long term.

The colloquium will consist of 20 minute papers and posters on any topic concerning variable stars, their theory and their observation including observing projects, equipment and techniques. Proposals for presentations should be submitted to any of the organisers.

The venue for the colloquium and the RASNZ conference is the Quality Inn, Cuba Street, Central Wellington – see <http://www.varstars.org> – for more information and future announcements. We look forward to seeing you there.

Bill Allen	whallen@xtra.co.nz
Tom Richards	tom.richards@varstars.org
Stan Walker	stan.walker@varstars.org



WANTED, PREFERABLY ALIVE – SOMEONE TO HANDLE MEMBERSHIP AND FINANCES

We are looking for a New Zealand resident who would be willing to act as Coordinator, Membership and Finance. It shouldn't be terribly onerous (not like a club treasurer) once the initial online subscribing and renewal systems are up and running, which are just about done. Some clerical work to keep the online database up to date, some Internet banking, some leg work down to your local branch of the National Bank of NZ when you receive an old-fashioned paper cheque, and some email work chasing people up. And of course keeping financial records. And you'll save poor old Stan a job so he can concentrate on newsletters and running the Long Period Variable Programme. He doesn't need a treasurer hat too!

If you'd like to put your hand up, please email tom.richards@varstars.org and I'll discuss it with you.

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