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Period Change Behavior of the Algol-type Eclipsing Binary LS Persei

Gary Billings
2320 Cherokee Drive NW, Calgary, Alberta T2L 0X7, Canada

Abstract LS Persei is an Algol-type eclipsing binary, known to exhibit period change due to mass loss or transfer. Timings of its minima have been extended back to 1892 by archival observations in the Harvard College Observatory Photographic Plate Collection, and forward to 2007 by CCD observations. Over this interval, LS Per has undergone significant period decrease ($\Delta P/P = -2.6 \times 10^{-4}$, $dP/dt = -2.0 \times 10^{-8}$). Small period changes are hard to document due to the relatively large uncertainty of minima timings from plates and visual observations, but recent, higher precision, CCD timings establish at least one small period increase ($\Delta P/P = +1.5 \times 10^{-5}$). The magnitude of this change, and the spectral type of the system, are compatible with the Applegate mechanism of periodic changes in the oblateness of the star which change the orbital period of the system. The ease with which high-precision minima timings can be obtained with a small telescope and CCD camera will allow early detection and close monitoring of future period changes

Long-Term Photometric Variability of 13 Bright Pulsating Red Giants

John R. Percy
Cristina O. Nasui
University of Toronto, Department of Astronomy, Erindale Campus, Mississauga, ON L5L 1C6, Canada

Gregory W. Henry
Tennessee State University, Center of Excellence in Information Systems, 3500 John A. Merritt Boulevard, Box 9501, Nashville, TN 37209

Abstract Red giant stars cooler than 4000 K are unstable to pulsation; pulsating red giants make up ten per cent of all the bright stars. We have merged long-term (typically twenty years or more) photoelectric *V* photometry of thirteen bright pulsating red giants (TV Psc, EG And, RZ Ari, η Gem, V614 Mon, RS Cnc, VY UMa, FS Com, SW Vir, R Lyr, EU Del, V1070 Cyg, and W Cyg),

from a robotic telescope, and from the photoelectric photometry program of the American Association of Variable Star Observers (AAVSO), and analyzed each merged dataset using Fourier and self-correlation techniques. Several of the stars show two or more pulsation periods, and we have derived improved values of these. We have also derived improved values of the enigmatic long secondary periods which are present in several of the stars, and whose cause is unknown. Most of the stars also show very slow, small variations in amplitude and mean magnitude on time scales of thousands of days, whose cause is also unknown. We will also discuss, briefly, the nature and value of this project as an undergraduate research experience.

A Multicolor Photometric and Fourier Study of New Field RR Lyrae Variables

Michael Koppelman
University of Minnesota, Department of Astronomy, 116 Church Street SE, Minneapolis, MN 55455

Richard Huziak
127 Maple Street, Saskatoon, SK S7N 0A2, Canada
and
University of Saskatchewan Variable Star Research Group

Walter Cooney
1927 Fairview Drive, Port Allen, LA 70767

Vance Petriew
3 Noonan Road, Regina, SK S4V 0J5, Canada

Abstract We present precision, multicolor light curves, new or updated ephemerides and Fourier components for four new or recently discovered RR Lyrae stars. We utilize [Fe/H] – ϕ – P relations to determine the metallicity, with separate relations for the RRab and RRc stars. Where possible we use a second method for determining [Fe/H] such as the amplitude in the Johnson *B* bandpass (A_B). The metallicities are then used to calculate a second-order determination of the absolute magnitude (M_V) and hence the distance (D).

Research Breakthroughs From Pro-Am Collaborations

David G. Turner
Department of Astronomy and Physics, Saint Mary's University, Halifax, NS B3H 3C3, Canada

Abstract Professional-amateur collaborations are proving to be an exciting means of pursuing vital observing projects in areas where regular professional monitoring has declined or disappeared in recent decades. Such is the case for RT Aur, a bright Cepheid well established from a century of observation to exhibit a steady decrease in pulsation period. That is, until observations by AAVSO and Belarus observers revealed that it is actually undergoing a steady period increase superposed upon a sinusoidal trend! Or the case of a newly identified Cepheid variable with a smaller light amplitude than Polaris (!), studied with the aid of regular monitoring from RASC'er Dave Lane's automated backyard observatory. Other examples include an eclipsing system that is not what it was long thought to be, and other cases of an ongoing nature. In an era where large-scale surveys are dominating fields once covered by dozens of individual observers, there is a growing need for links with keen observers of every stripe to fill the "discovery void" occasioned by the benign neglect of professionals.

Slowly Pulsating B Stars: A Challenge for Photometrists

Robert J. Dukes, Jr.
Laney Mills
Melissa Sims
The College of Charleston, Department of Physics and Astronomy, Charleston, SC 29424

Abstract Slowly Pulsating B Stars (SPBs), which are mid- to late-B stars, are some of the most difficult of the bright pulsating variables to observe, are some in the most need of observation, and are some which would benefit greatly from being placed on a regular observing program by a single observer. They have characteristic periods on the order of 1–3 days with very small amplitudes (<0.03 magnitude in Stromgren *v*). These characteristics present the challenge and as well as an opportunity since there are very few groups currently observing these stars. While more rapid pulsators, such as the δ Scuti and β Cephei stars, benefit from multi- longitude campaigns the SPBs do not lend themselves to this type of approach because of their relatively long pulsation periods which require observations spanning months rather than weeks over several years to adequately describe. Our work with SPBs is supported by NSF grants.

One Little Telescope, So Many Stars

Jaymie Matthews
University of British Columbia, Department of Physics and Astronomy, 6224 Agricultural Road, Vancouver, BC V6T 1Z1, Canada

Abstract This meeting coincides with a Canadian space astronomy milestone, marking four years that the MOST space telescope has been in orbit. In that time, MOST has more than lived up to its acronym by making major discoveries through ultraprecise photometry of the *M*icrovariability and *O*scillations of *ST*ars. Hundreds of stars. MOST has discovered new classes of pulsating stars among the hot massive B stars and nonradial oscillations in red giants which challenge theoretical expectations. By monitoring the acoustic beats of pre-main sequence stars, MOST is literally performing "ultrasound" on stellar embryos to test our models of star formation. MOST has measured the surface rotation profile of a young solar-type star, giving insights into what the magnetic field and spot activity of our own Sun may have been like when life first appeared on Earth. MOST asteroseismology of magnetic stars has resulted in the first direct tests of how magnetic fields interact with the stellar plasma, making such stars as magnetohydrodynamic laboratories. MOST measurements of the optical eclipse of an extrasolar planet lead to the albedo of a "hot Jupiter" and an understanding of its atmosphere, clouds, and even weather. MOST has begun the search for Earth-mass and -size planets around other stars. Not bad for a mission that was intended to last one year and study ten stars.

Suspected Variables in AAVSO Star Fields

Richard Huziak
127 Maple Street, Saskatoon, SK S7N 0A2, Canada

Abstract The master listing of stars observed by the AAVSO is listed in the "Validation File". The file lists commonly observed variable stars but also lists many "obscure" stars within the fields of view that observers over the years have suspected of being variable. Over the century-long history of the AAVSO over 1,200 such suspects have been added, but this population has never been investigated in detail. Our project first identified each suspect with a catalogue name and position, then using CCD cameras we are now sorting out the true variables from non-variable stars. A small but significant percentage of these stars turn out to be variable, sometimes of surprisingly large range. Unfortunately, some of these variables have been used as comparison stars by visual observers over the years. And now with the fields being explored by CCD camera users, even small-range unrecognized variables stars can cause confusion and skewed data. It is thus important to identify the field suspects and eliminate them as comparison stars.

The AAVSO Standard Star Database (VSD) and the Variable Star Plotter (VSP)

Vance Petriew
3 Noonan Road, Regina, SK S4V 0J5, Canada

Michael Koppelman
University of Minnesota, Department of Astronomy, 116 Church Street SE, Minneapolis, MN 55455

Abstract The AAVSO is refining its electronic chart plotting system in order to eliminate the manual task of creating paper-based charts. We will demonstrate the system, discuss the status and to-do list and show a technical peek into the inner-workings of the system.

Automated Variable Star Observing and Photometric Processing at the Abbey Ridge Observatory (ARO)

David J. Lane
P.O. Box 31013, Halifax, NS B3K 5T9, Canada

Abstract In the second half of 2006, the author's backyard observatory began observing (mainly Cepheid) variable stars in collaboration with David Turner and Daniel Majaess of Saint Mary's University. This paper will describe the automated variable star observing and photometric processing software (Abbey Ridge Auto-Pilot and accompanying scripts) developed for and in use at Abey Ridge Observatory. This software completely automates observing the fields, taking calibration frames at night's end, calibrating the images, combining sequentially-taken images, astrometrically solving the images, and doing the aperture photometry of the selected stars. At the end of the night, the resulting calibrated images and EXCEL-compatible photometric data are automatically uploaded to an internet server and human-readable summary emails are sent to the observer. As input to the software, the observer provides two types of text files. The first type contains the list the fields to be observed on a given night. The second type is a simple database of information about the fields, including such things as: the equatorial coordinates of the field; the exposure details in each filter; the equatorial positions of the target, reference, and check stars; and the aperture photometry settings.

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