

# THE <sup>DAVID</sup> DUNLAP DOINGS

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*Comet Halley*

*20 min. exposure taken by I. Shelton, Las Campanas Observatory, 9    March 1986  
with Carnegie 10-inch astrograph.*

## CONGRATULATIONS

To *Stefan Mochnecki* who recently received tenure in the Department with automatic promotion to Associate Professor.

To *Richard Gray* who has received not one but two post-doctoral fellowships. The first is a NATO Fellowship, the second is from the American/Scandinavian Association. Fortunately the two fellowships can be used back to back for a total of two years. Richard plans to go to Denmark to work with Olsen.

### *Potpourri*

Don Fernie is now the chairman of the AAS Warner/Pierce Prize Committee.

Don Fernie has accepted a further 3-year appointment to NRC's Associate Committee on Astronomy as representative of the Royal Society of Canada.

Joan Wrobel, a recent graduate from the Department, was back in town for a week in April. During her visit in which she was collaborating with Ernie Seaquist, Joan also found time to give a Departmental Colloquium on "Recent Radio Observations of E and SO Galaxies".

Slavek Rucinski attended the IAU Symposium No. 118, "Instrumentation and Research Programmes for Small Telescopes" in Christchurch, New Zealand (2-6 Dec. 1985). He gave a review paper on Contact Binaries. The angular-momentum-loss and the resulting orbital decay of detached (but close synchronized) binaries was discussed as the most promising mechanism for formation of contact binaries and for control of their subsequent evolution.

## *PURSUING THE ROSETTA STONE*

Although it has been some time since I reported on the twin photometer system on the 0.6m and 0.5m telescopes at DDO, I am happy to say that it continues to work well and has been in steady use for some two years now. This past winter I've had occasion to show myself how much can be accomplished with it when one really wants to go after something.

I was at a meeting in December at which a student from a small American College gave a paper describing a photometer they had built and how they had tried it out on a randomly chosen eclipsing binary (although only getting four points!). I was dozing off through all this when the speaker said something that brought me suddenly wide awake. This binary, he said, is a long-period one composed of two supergiants, one of which is a cepheid variable.

For the uninitiated, let me explain that a major problem in cepheid research that has been around now for quite a few years is that we have only indirect and conflicting evidence as to their masses and radii. Since cepheids play an important role in several areas of astronomy it is disturbing that we have doubts about some of their most fundamental properties. What is needed, and has been searched for so far without success, is a cepheid in an eclipsing binary that could yield a direct determination of its mass and radius. Hence my sudden awakening: could this binary be the long-searched-for Rosetta Stone? The speaker knew no further details, so it became a matter of impatiently waiting out the meeting to get home for a literature search.

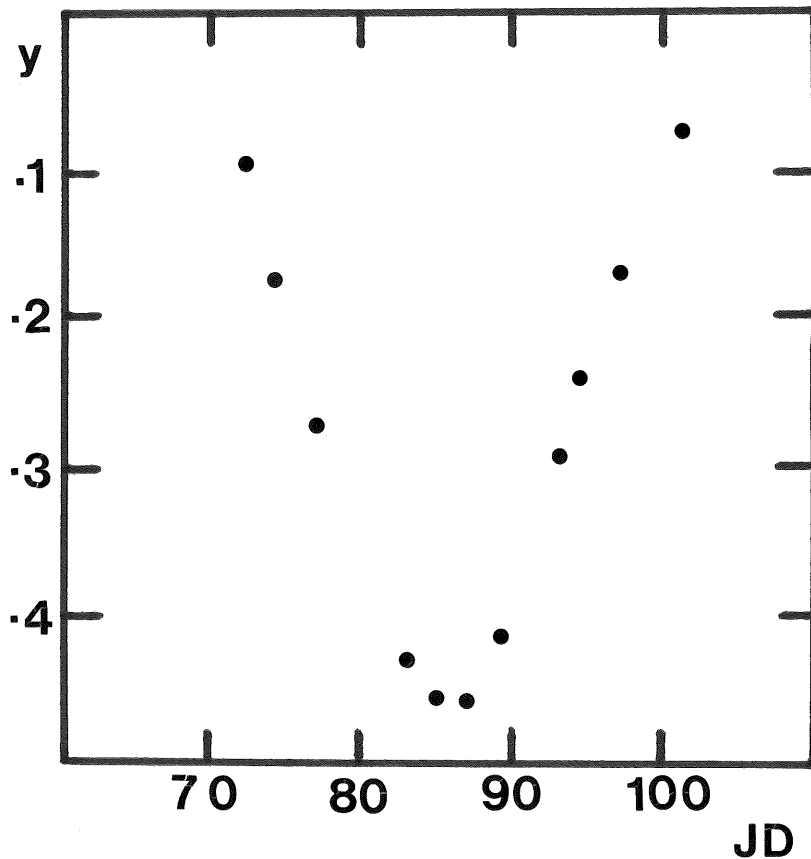
And sure enough, there it was! Thirty years ago a fellow in Germany observed this binary and from its variability outside eclipse concluded one component is a 27-day classical cepheid. He went on to derive its mass and radius, noting that his results were somewhat unexpected.

A closer look at his paper gave rise to misgivings. The primary star is an A-supergiant, and a fainter cepheid companion would be most unlikely. Moreover, his data, while supposedly photoelectric, looked pretty tatty, and mention of such equipment as a 'spiegelelektrometer' hardly inspired confidence. Clearly one would have to launch a whole new observational assault on the system before shouting it from the rooftops.

Since the binary period is nearly 200 days it would take a while to do it properly, but as luck would have it, the existing ephemeris showed that a primary eclipse, lasting some six weeks, was about to begin in January. Luck ran out, however, when it was seen that this encompassed some of the worst weather of the year, and that the star was then rapidly sinking in the evening twilight sky.

But the primary eclipse was particularly important. When it happens, more of the total light is due to the secondary star than at any other time, so if this secondary really is a cepheid, its own pulsational changes should be more readily detected then.

Slavek Rucinski, who is also currently using the equipment, kindly made available to me the first hour of each of his nights, so I could go after the beast whenever it could be seen. Despite rather worse than average weather, it was possible to get an observation at a rate better than every fourth night right through January, February and March. Needless to say, most of these nights were far from photometric in the usual sense, with fog and cloud and temperatures sometimes at -17 Celsius, while the star was at ninth magnitude and air mass 2 in the twilight sky, yet the internal errors in the yellow magnitudes (an 8-filter system was used) for each night were all under 0.01 mag, averaging 0.006 mag. This typically took a total of about one minute of integration per filter, collected in 2-second packages. the observations made during the deepest part of the primary eclipse are shown in the figure.



These data are much better than any hitherto available for this star. For instance, whereas previous results could only establish an epoch of minimum to within two or three days, the present data do so to within hours.

This precision under these circumstances could only be achieved because of the equipment's quite astonishing stability. One usually turns both telescopes on the same star about once an hour to check for drifts in their relative sensitivities, but none has been found whether over hours or days. If allowance is made for an ambient temperature coefficient of about 0.001 mag/deg, I can tell you with confidence what the relative sensitivity was at any time over the three months to within 0.004 mag or better.

As to the Rosetta Stone, well, alas and alack, hopes have faded. Stefan Mochnacki and I intend doing a proper job of analysis when we've got the whole lightcurve, but meanwhile I find those points in the figure can be fit with a low-order polynomial to within 0.008 mag – just the expected observational scatter with no room for an additional 27-day oscillation. Damned spiegelelektrometers ...

Don Fernie

#### PAPERS SUBMITTED

- |   |  |
|---|--|
| C. Corbally<br>R.F. Garrison  | MK Spectral Classification for 30 Faint Stars in Praesepe.                                   |
| J. Kaluzny<br>S.M. Rucinski   | The Combined Photometric and Spectroscopic Solutions for Contact Binaries BV Dra and BW Dra. |
| C. Clement<br>J.M. Nemeč<br>N. Robert<br>T. Wells<br>R. Dickens<br>E. Bingham | Double Mode RR Lyrae Stars in the Globular Cluster IC 4499.                                  |
| L. Noreau<br>P.P. Kronberg  | The Amorphous Galaxy NGC 3448, I. Dynamics and Photometry.                                   |

## OBSERVATORY IS GIVEN NRC FILMS

*Readers may recall that a couple of years ago we had some dealings with the National Film Archives in Ottawa over old newsreel footage of the Observatory's early days. The person with whom I dealt at the time was the heroic Mr. O'Farrell, still, I am happy and surprised to report, thriving amidst his stocks of nitrate-base film.*

*Mr. O'Farrell called me a while ago to say that his office had acquired multiple copies of a number of astronomy films from NRC, and since the extra copies would otherwise be thrown away, would we like to have them? I write here merely to report that these have now arrived.*

*There are five reels, several fairly substantial with running times of around 25 minutes. Two shorter ones are enigmatically entitled Research Brief No. 2 and Research Brief No. 3. There is a CBC production called simply Herzberg, while the fourth and fifth films are *To the Edge of the Universe*, and *Road to Mauna Kea*.*

*I have as yet had no time to run any of the films through a projector. Members of the Department interested in doing this should let me know.*

*Don Fernie*