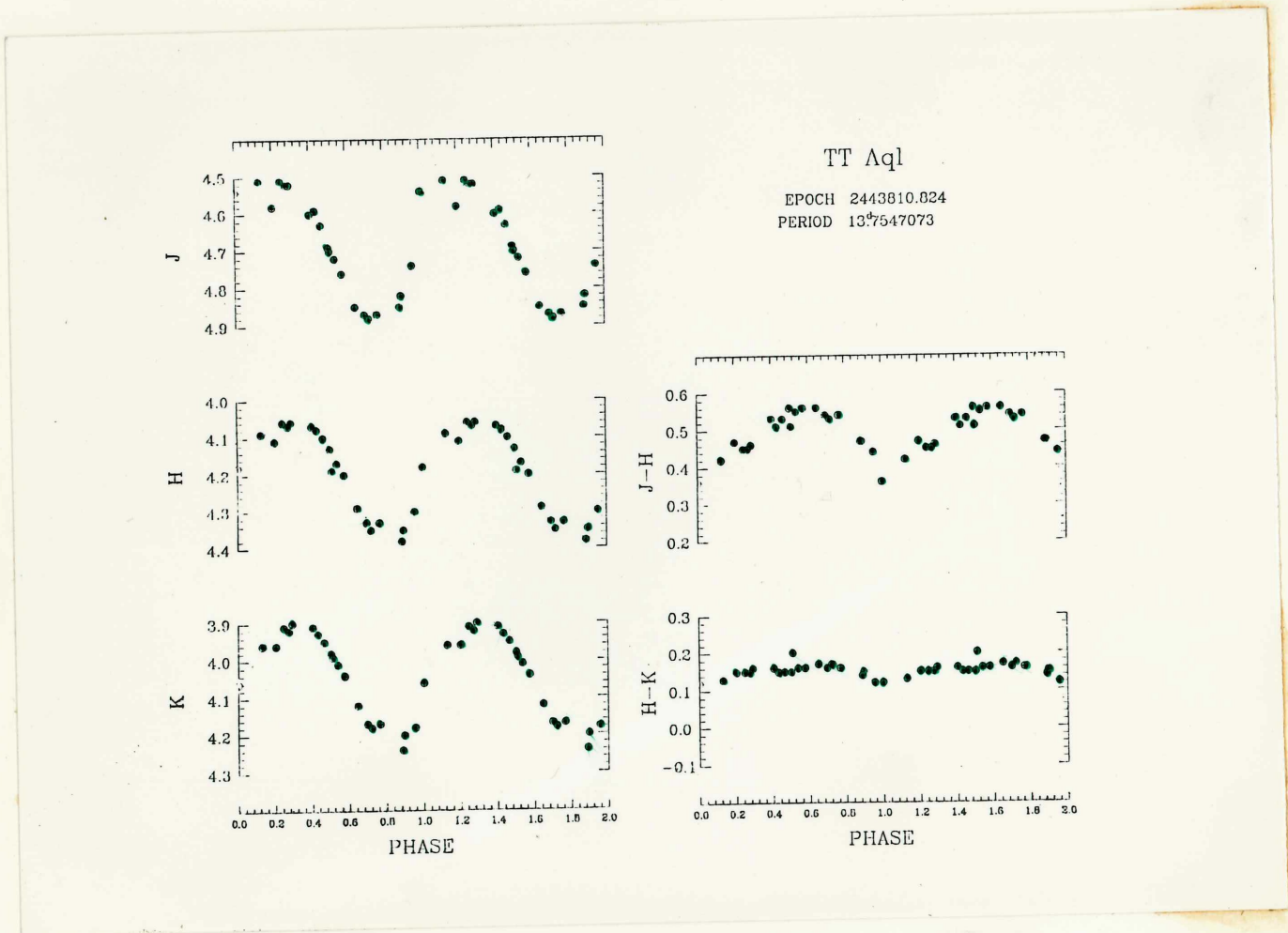


THE DAVID DUNLAP DOINGS

Vol. 16, No. 3

25 April 1983



Editorial

It is now time to express our best wishes to Don MacRae and Peter Martin, since changes in their activities have made it necessary for them to resign from the editorship of the DDD which they have handled so capably. Don we hope to catch for some comments in a future issue about his long association with the Department and future plans. Peter we hope will keep us supplied with DDD stories about the new Institute (anecdotes about creating a bureaucracy) to underscore the interaction between the Department and this exciting new entity. Their diligence in ferreting out stories, pleasant (and effective) persistence in obtaining contributions, and efforts in making the writing clear and effective will be hard to match. However we shall try to keep the Doings full of current news, useful information and amusing gossip so that it will be as eagerly read as it have been in the past.

Thanks to Don and Peter for a job well done.

Nancy Evans
Barry Madore

COVER: This month we feature some typical (ie. one of the best) infrared lightcurves for a galactic Cepheid, as published in Doug Welch's recent master's thesis (see page 13 for the abstract). Some of the noteworthy features are, the much reduced amplitude in the infrared as compared to the optical (+0.15 mag), the cycloidal variations (reminiscent of radius rather than temperature variations) and the small scatter (showing that, with care and good detectors, infrared photometry can compete in accuracy with optical photometry).

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C O N G R A T U L A T I O N S

To Armando Arellano-Ferro who successfully defended his doctoral thesis entitled "A Study of the Pulsational Properties of Small-Amplitude Yellow Supergiants". Armando's supervisor was John Percy. Armando is returning to Mexico to secure his position in astronomy there but plans to revisit the DA soon to finish reducing his IUE data on hot companions to yellow supergiants.

To Joan Wrobel who also successfully defended her thesis, supervised by Ernie Seaquist and entitled, "Radio Continuum Observations of a Sample of E and S \emptyset Galaxies". Joan is now off to Cal Tech where she is taking her NSERC post-doctoral fellowship.

To Petrusia Bojetchko-Kowalsky and Douglas Welch both of whom completed their Master's degrees and submitted theses. Petrusia's is entitled "An Alternate Formulation of the Equation of Transfer for LTE Atmospheres" and was supervised by John Lester; Doug's thesis was on "JHK Observations of Classical Cepheids and an Improved Calibration of the Infrared Period-Luminosity Law", supervised by Bob McLaren. Both Doug and Petrusia are continuing on in the doctoral programme here at U. of T.

ABSTRACTS OF THESE THESES WILL APPEAR IN THIS AND FORTHCOMING ISSUES
OF THE DDD.

The Promotions Committee of Scarborough College has recommended that Charles Dyer be promoted to Associate Professor (without tenure). Our enthusiastic congratulations to Charles on this well-earned recognition.

Don Fernie has been nominated as the representative of the Royal Society of Canada to the NRC's Associate Committee on Astronomy for the next three years.

To John Percy who was recently elected to the Council of the Royal Canadian Institute.

To Geoff Clayton who received a post-doctoral fellowship from NSERC. Geoff is working on the polarization and extinction properties of dust in the LMC.

P O T P O U R R I

Chris Stagg has begun his doctoral thesis with a trip to the Las Campanas 0.61m reflector. From March 25 to April 13 Chris will be photometrically monitoring Be stars.

Chris McAlary (now working with Rieke at LPL, Tucson) was visiting the DA from March 9 through 18. He was consulting with Barry Madore and Doug Welch about the infrared cepheid programme as well as getting a bit of VAX time in, (between bottles of *Brador*).

Peter Biermann made a brief visit to the Department on March 14, kindly finding enough time to give a colloquium in between consulting with Phil Kronberg.

Dr. Gary Ferland, University of Kentucky, visited the Department for the week of March 14. He was continuing work with *Peter Martin* on the physical conditions in the envelopes of novae.

On March 3, *John Percy* spoke to the Hamilton Centre, RASC, on "The Travelling Astronomer".

On March 14-15, *John Percy* also visited Concordia College, Moorhead, Minn. under the auspices of the AAS Shapley Lectureship Program, and gave a series of five lectures/seminars on various topics.

LOGO Contest

The deadline for entries in the DDO/DA logo contest passed without enough entries being received to justify continuation of the competition. Apparently this was not an idea whose time had come. My thanks to the two individuals who took the trouble to submit entries. Their efforts have not been entirely in vain, as two of the three entries will provide good material for the next issue of the Droppings and/or Christmas Countdown.

Tom Bolton

A Report on "Recent Travels"
by Raymond Rusk

Barry asked me to write a few words, for the DOINGS, about my recent travels. So here they are. I spent early January in sunny California, arriving in Los Angeles on January 2, one day after the Rose Bowl game, for a three week stay with Readhead's VLBI group at Cal Tech. My reason for being there was to familiarize myself with the VLBI data reduction software and then to run some simulations to test the feasibility of doing VLBI "snap shot" observations. This would allow me to conduct a survey of many highly polarized compact radio sources, to check for correlation between morphology and degree of polarization. (One would not expect an optically thick radio source to be highly polarized.) From my simulations, using real data collected by Readhead and Pearson as part of their 6cm survey, I decided that while it might be feasible to do "snap shot" observations (30 minute observations at four widely spaced hour angles), it probably would be more useful to observe fewer sources more thoroughly. While at Cal Tech, I prepared my proposal to the U.S. VLBI network, and had it "reviewed" by a couple of real experts. Since this was my second attempt to get VLBI observing time, I was somewhat anxious about my proposal. [I have recently learned that during the June run, I will receive all of my requested observing time in a block. This was welcome news, especially since I had not anticipated any time before the July-August VLBI run. (The NETWORK operates for two weeks out of every two months.)] When I returned from Cal Tech I brought back the VLBI software package, and now have it running on our VAX. It contains a graphics library which supports Versatec, Printronix, VT125, Tektronix and Grinell graphic devices, which may be of interest to others in the department. If you want to try this package out, see me for documentation. Compared to HEPLLOT and CHRISPLOT, this documentation is straightforward.

I left California on January 22, the day the storms broke out. While I was there, the daytime temperatures were mostly in the low eighties and the skies were clear. The days were too short for "smog" conditions to occur. Most days, I had lunch at nearby outdoor restaurants with the VLBI crowd. I must say that I found the VLBI group there friendly and helpful. They are used to having visitors and made my trip go very smoothly.

Ernie Seaquist, Carl Bignell, and I received time on the US VLBI network in February (on Valentine's Day) to observe a SNR in NGC 4449 using the sensitive Mark III recorder system. We used the VLA in phased-array mode (18cm, C array), Green Bank and OVRO. I spent a week at the VLA, preparing for and assisting Carl Bignell with the observations--the Mk III recorder eats up a large computer tape every thirteen minutes--and then I prepared an 18cm VLA map of NGC 4449 from the VLA observations. We made two, two-hour observations, separated by four hours. The 18cm VLA map looked very much like the 6cm map, and confirmed that the unresolved SNR was 15mJy in strength. My stay at the VLA (located on the Plains of St. Augustine) was uneventful. The observers' quarters were nice, but the food was bland. At the site, only bag lunches are available for supper. There is a kitchen and some canned provisions if you have the time to cook for yourself. Since I found that I could get a whole VAX to myself around supper time, I went with the bag lunches, except for two evenings when I forgot to order them in advance.

In early March, I went to Haystack Observatory in Massachusetts to correlate the tapes. Actually, the astronomer in charge of the correlator, Bob Phillips, and the operators did most of the work. The procedure is involved, and the HP computer system is not "user friendly", so mostly one has to watch. It is only recently that observers have been urged to participate in the process. Bob told me that I was only the third visiting astronomer to oversee the tape correlation.

Visiting scientists are housed in a trailer near the telescope (which is completely enclosed in a fiberglass dome). Haystack is about 40 miles from Boston, but it is relatively remote. The nearest restaurant is about 5 miles from the observatory. Unfortunately, our VLBI experiment gave a null detection, which is a real bother, because of the large number of things that could have gone wrong. It seems reasonably clear that we resolved the source out with a 40 milli-arcsecond beam, however, while it is unresolved with a 70 milli-arcsecond beam, so something came out of the effort. And of course, there is the 18cm VLA map.

Readers who have made it to here may have observed that my account of "recent travels" lacks the local color that Barry's reminiscences contain or the melodrama of Geoff's "gossip" column. My defence is that I spent most of my time glued to a monitor. I suppose I could have made something of my night of wrenching stomach disorder before my flight to Boston but fortunately I can't supply an autopsy report to substantiate my claim so ...

GASA GOSSIP: THE VIEW FROM THE BACK ROW

Afternoons at DA are quiet. The denizens of the 13th and 14th floors, lulled by lunch and the 90 degree heat exhibit a low level of activity. But on Wednesdays at about 3:20 something happens. The graduate students become restless and start pacing around in their cages, I mean offices, coffee cups in hand. It's colloquium day and the aroma of freshly brewed coffee has wafted its way out of 1403 and down the hallways. The students are pacing because the coffee isn't available until the end of the staff meeting. This is due to the fear, probably justified, that the students will eat all the cookies if they get to them first. At about 4:09, after a caffeine and sugar fix most people have roused themselves enough to brave the trip to the first floor and they jam into the elevators. Last year one colloquium had a very small audience when 17 astronomers were trapped in an elevator between floors.

Being creatures of habit most people, entering room 137, head for their usual seats. The occupants of the back row are hidden behind copies of the Varsity. When the talk begins the newspapers are folded up and attention is focused on the speaker as he tries to figure out how to turn on the overhead projector. At this point, no matter how interesting the talk is and despite the infusion of caffeine several people, including this reporter, have trouble keeping their eyes open especially if there are any slides. But on the whole the audience is attentive and at 5 o'clock many are eager to attend another seminar: G2001.

Ctn

Shop News

The electronics shop relocation mentioned in the Shop News in the January DDD has now been completed. All of the shop activities that were spread around the second floor have moved into the large room on the northwest corner of the building. The old electronics shop is now used as an office, and all of the lab activities (including the Nova computer) have been moved into the darkroom/catalogue room. This should provide a better working environment for all concerned. During the relocation, a new public CRT terminal was set up in the new office space.

Most of the small construction and maintenance projects mentioned in the January report have been completed. In addition, the twin photometer system has been completed and delivered for testing on the 24-inch and 19-inch telescopes. The sine corrector project that has given us so much trouble has been abandoned in its present form in favour of a much simpler design. We expect this to be completed in time for Bill Weller to install it during his observing run in May.

Steady progress is being made with the engineering tests of the Chant reticon system. At this writing, there is some feeling that all of the sources of problems have been identified, but the tests that are required to establish this have not yet been completed. Meanwhile, the design work for the reticon detector, which will be used on the echelle spectrograph on the Las Campanas 24-inch, and the schectograph for the 74-inch telescope has begun. Mochnacki and Weller will visit D. Latham at SAO in Cambridge this month to discuss the design of the latter system.

Most of the work now underway in the shops is connected with these detectors or with modifications to the cassegrain spectrograph which are required to allow the Chant reticon and schectograph to be used to maximum advantage. The major construction now underway includes:

1. New exposure meter. The new system will have a cooled PMT for improved stability and sensitivity. This will correct the stability problem that has plagued the present uncooled system. The new system can take a wide variety of filters - a feature that will be especially useful when it is used with the reticon. It will be installed on the spectrograph in May.
2. Grating mount. The mount now under construction will allow gratings to be changed very rapidly. It is designed to allow gratings to be rotated rapidly and positioned very accurately under either manual or computer control. These features will be very useful when observing with the electronic detectors. We expect to have this system installed around July 1.

Mochnacki and Kamper have started preliminary design studies on a new TV guider and comparison feed system for the spectrograph. This is necessary because the present TV system does not have enough sensitivity to allow us to exploit the capabilities of the schectograph. The design specifications for the new system also call for them to be operable under computer control. Kamper and Blyth have also begun preliminary work on new collimator mounts, which are required to accommodate the new exposure meter and to improve the thermal stability of the spectrograph.

There is considerable feeling among members of the shop committee that these will be the last major modifications to the cassegrain spectrograph. The instrument is now 20 years old, and it was not designed to do many of the jobs we are asking it to do. It has become very difficult to find ways to modify it to do these jobs without compromising its ability to take high quality, moderate dispersion photographic spectra - a task for which it is superbly suited. As a result, we have begun to discuss informally the possibilities for a new spectrograph. There is special interest in obtaining a system

to provide higher resolution than we can currently obtain. The general consensus is that the best solution would be a "pseudo-coudé" spectrograph, which could be located on the east side of the observing floor and fed by a fiber optics link to the telescope. Karl Kamper is now trying to master the fiber optics technology that would be required to do the job.

Tom Bolton

LAS CAMPANAS NEWS
by Bob Garrison

This has been the year of "El Niño", but not the one internationally sponsored to celebrate children! This "El Niño" is the global weather pattern that has caused torrential rains and floods in California, a drought in Hawaii due to the absence of the Trade Winds, and a warm winter in Toronto. The effect in Chile has been an unusually large amount of cirrus activity due to the presence of warm water off the coast instead of the usual cold Humbolt Current. The statistics have not been compiled yet but it appears to have been a reasonable year for spectroscopy and a bad one for photometry. Len Bradfield, working for FitzGerald, managed to do spectroscopy during 95% of his six week run, but had to all but abandon his photometry program. Shelton has managed to do some good photometry and Stagg seems to be doing well so far (with 3 more nights to go on his run). So it hasn't been disastrous for photometry, but we have come to expect much better. "El Niño" apparently occurs every 10 years or so, but this is one of the worst this century. It is nice to know that even on a "bad" year, it is possible to get good science done at our "wonderful window" in the south.

There are several plans for improvement of our equipment in Chile, some of which are already in process; others are in the dream phase. An Osborne portable computer has been purchased for data acquisition and analysis, and eventually telescope control. The current computer, an HP 9815 will serve as a backup. The Osborne will be sent to Chile in June after it and the new Resident Observer have checked each other out.

The echelle spectrograph, which is awaiting mechanical and electronic interfacing with the reticon (also operating with an Osborne) will eventually be sent to Chile for high quality stellar atmospheres and radial velocity work on bright stars. The echelle is complete, and the reticon with its two Osbornes is in hand. The big holdup now is shop time. In addition, Barry Madore is exploring the possibility of a "Galileo" style CCD for direct photography, which is an exciting possibility if it can be realized. There are many interesting problems that don't require large telescopes and that can be solved with instruments such as these at a good site.

Our old faithful tape recorders will be supplemented by a new Sony TC399 tape deck. Our TC230 has been operating for almost 11 years now (though it is a bit like an Irish gun with none of the original parts!) and the TC270 for almost 6 years. Their mechanical parts are well-worn from constant use under harsh conditions (average of 12 hours a day, 7 days a week with temperatures near freezing and humidity about 2% at times), but their amplifiers and speakers still seem to be functioning. The new tape deck will provide a new mechanism for the faithful electronics. We have collected about 100 reels over the years; I provided about 15 tapes and several other supplied an additional 15, but Rick Crowe carefully recorded at least 70 reels. And what a beautiful collection it is!

The new Resident Observer is Robert Slawson from UBC. He has a good background in astronomy and computers as well as considerable experience with electronic and mechanical problems. This is the furthest afield we have ever gone for hiring a resident, but I think it reflects our growing international reputation. We had applications this year from Japan and from the AAT in Australia. Bob Slawson will begin his training at DDO in May with the help of Tony, Karl, Lynda, Bill, Frank, Joan and the rest of the staff at DDO. In July, he will have an overlap in Chile with the current Resident before being left on his own.

COLLOQUIA*

- March 9 Dr. Jeffrey Crelinsten, SSHRCC Fellow, U. of Toronto,
"The Dynamics of a Scientific Revolution: Astronomer's Early
Reception of Einstein's General Theory of Relativity"
- March 14 Dr. Peter Biermann, Max-Planck-Institut für Radioastronomie,
(Monday) "Radio Through X-Ray Observations of a Complete Sample of
Radio Selected Active Galaxy Nuclei"
- March 16 Geoffrey Clayton, University of Toronto,
"Dust in the Large Magellanic Cloud"
- March 23 Dr. Lee Anne Willson, Erwin W. Fick Observatory,
"Symbiotic Stars"
- March 30 Dr. Rainer Wehrse, Center for Astrophysics, Mass.
"Atmospheres for M Giants and Supergiants"
- April 13 Ed Anderson and Fred Schmidt, University of Toronto,
G2000 Current Literature Seminar
- April 20 Alex Fullerton and Bernard Bois, University of Toronto,
G2000 Current Literature Seminar
- April 27 Dr. Helmut Abt, Kitt Peak National Observatory,
"The Occurrence of Ap and Am Stars in Clusters and
Multiple Systems"
- May 25 Dr. Ron Ekers, V.L.A., Socorro, New Mexico,
"Radio Observations of the Galactic Center"

*Unless otherwise noted, colloquia are held on Wednesdays at 4:00 P.M. in Room MP 137 with TEA at 3:30 in the Reference Room, MP 1404.

PAPERS SUBMITTED

J.D. Fernie
R. McGonegal

Cepheids in Open Clusters and Associations

M. Clement

Normal Modes of Oscillation for Rotating Stars.
II. Variational Solutions

N. Duric
E.R. Seaquist
P.C. Crane
R.C. Bignell
L.E. Davis

VLA Radio Continuum Observations of the Edge-On
Spiral Galaxy NGC 3079

J.R. Percy
D.L. Welch

Photometric Variability of B and A Type Supergiants

A. Arellano Ferro

Period and Amplitude Variations of Polaris

N.R. Evans

A Search for Light-Time Effects in Binary Cepheids:
AW Persei

C. Rogers
P.G. Martin
D.R. Crabtree

The Circumstellar Dust of M_{μ} Cephei

P.P. Kronberg

M82 A Nearby Laboratory for Rapid Star Formations and
the Phenomena of Active Galactic Nuclei

J.D. Fernie

A One-Line Algorithm for Julian Date

M. Pedreros
B.F. Madore

Photographic Photometry of the Galactic Cluster
NGC 7790

The Library Committee (finally) Reports

After months of surveys, questionnaires and meetings the Library Committee, (Lynda Colbeck, Rick Crowe, Barry Madore and chaired by Ernie Seaquist) has submitted its recommendation to the Department. We reprint below a few excerpts from that report which basically recommended that the main collection be located on the 13th floor of the Physics Tower on the St. George campus. The Report was discussed at a recent Staff Meeting, accepted and further steps are now being taken to implement the move as smoothly as possible.

ABSTRACT

The basic recommendation of this report is that in order to fulfill the library needs of the faculty and students of the Department of Astronomy, the main library should be located on the St. George campus and that a branch library (akin to the Reference Room at DA) be retained at the Observatory. This recommendation is based on the premise that the library is the principal common research tool of the Department and must be accessible to the majority of faculty members and students. The report assesses the pros and cons of the issue and concludes with a proposal for the move.

Report of the Library Committee

The purpose of the library is to fulfill the research and teaching needs of the faculty members and students of the Department of Astronomy. The Library Committee was set up by the Department because there is a lack of consensus on the appropriate means to fulfill this purpose. Its terms of references set out by Don Fernie on July 26, 1982, included the preparation of a set of recommendations on the future of the library at DDO and the DA Reference Room. We were asked to address such questions as whether the library at DDO should be moved down in toto, whether parts of the DDO system should remain at DDO, with the DA system greatly expanded, or any other alternatives that arise. Our report was also to contain the financial and space implications of its recommendations as well.

This report contains the conclusions of the Committee and the reasons for these conclusions. Our assumption is that the Department will continue to operate as it does at present. One factor which cannot be ignored however is the Canadian Institute for Theoretical Astrophysics (CITA) which would be located on the downtown campus. The impact of this development was included in our discussion toward the end of our deliberations, but our conclusions were reached without regard to whether CITA becomes a reality or not.

Committee Consensus

After reviewing the surveys and the briefs, the Committee came to the unanimous conclusion that the main departmental library should be located downtown, and a branch library should be kept at DDO. We will discuss this recommendation in section 5, but for the moment we justify this conclusion on grounds of principle.

The overwhelming argument is based upon the fact, as Survey I shows, that the center of departmental activity is now on the St. George Campus. All staff and students are expected to be downtown at least once or twice a week. This includes

the Scarborough College and Erindale College staff. If the present departmental organization with its four locations were being planned from the start, then it would make so sense to place the library at DDO, since it is the one research tool in the Department that everyone uses. One brief makes this point clear: "If the main collection were now downtown, then it would be unlikely indeed that a library committee would be addressing the question of moving the collection". If this argument is true then the only consideration is whether in the present circumstances there are considerations making such a move impractical.

In addition to the arguments presented in the briefs, there is an additional consideration. The Library Annual Report for 1981/1982 p.3 (in Appendix III a)) gives sufficient evidence to indicate that the use of the library at DDO is declining. The number of items being signed out is dropping. This cannot be explained by an increasing tendency to photocopy articles at DDO since there is no evidence from the Xerox records that this is the case (Appendix III b).

It is vital not to confuse the present library issue with other issues such as the future of DDO as a research facility or consolidation of observatory activity downtown. The Library Committee makes its recommendation on the assumption, implicit in our preamble, that the David Dunlap Observatory will continue to be a vital and productive component of the Department. Therefore special care will have to be taken to ensure that the branch library at DDO serves the special research needs of the DDO staff.

THESIS ABSTRACTS

"Study Of The Pulsation Properties Of Small-Amplitude Yellow Supergiants"

Armando Arellano Ferro

A study of 14 galactic small-amplitude yellow supergiant variables has been carried out in order to determine their pulsational properties. They can be divided into two groups: periodic short-period ($P < 8$ days) and semi-periodic long-period ($P > 40$ days) stars.

Seasonally simultaneous UBVR photometry and radial velocities are obtained.

Periods were determined or refined using Deeming's (1975) technique. The period of Polaris was found to have been steadily increasing for the last 100 years. The amplitude also appears to be undergoing secular changes.

For the short-period stars the wings of H_{α} were used to determine effective temperatures. Empirical radii, luminosities and masses were determined. The short-period stars lie inside and seem to be on the red side of the observational Cepheid instability strip. It was found that these stars are likely pulsating in the radial fundamental mode. HR 8084 (DT Cyg) is suspected to be a first overtone pulsator. As the small-amplitude Cepheids in the LMC are thought to be first overtone pulsators and as the amplitude trend across the instability strip was found by Cogan to be the opposite for galactic Cepheids than for those in the LMC, it is suggested that small-amplitude sinusoidal variation and first overtone pulsation can exist independently.

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"An Alternative Formulation Of The Equation Of Transfer For LTE Atmospheres"

Petrusia Bojetchko-Kowalsky

An existing LTE atmosphere code, ATLAS, uses the integral formulation of the equation of transfer and the Avrett-Krook temperature correction scheme. It has been modified in order to use a variation of the complete linearization method: the differential form of the equation of transfer is linearized in temperature and the resulting system of equations is solved with the Rybicki method. The resulting increase in efficiency would be beneficial for problems using the general, yet time-consuming Opacity Sampling Method, e.g. line-blanketing and peculiar abundances. However, test calculations produce temperature corrections that are affected strangely by the presence of the opacity derivatives needed for the differential linearized method. The calculation of these derivatives may not be rigorous enough, taking into account only the explicit dependence of the opacity on temperature, but it is the only way to preserve the constantly-updated realistic opacity subroutines of ATLAS.

* * *

"JHK Observations Of Classical Cepheids And An Improved
Calibration Of The Infrared Period-Luminosity Relation"

Douglas L. Welch

New JHK photometry is presented for sixty-eight galactic classical Cepheids. Full phase coverage observations of twenty-five Cepheids are used to determine the relationship between UBV and JHK amplitudes, and phases of maximum and minimum brightness at J, H, and K are tabulated for these stars. A procedure for recovering mean JHK magnitudes from single-phase observations is also described.

New JHK period-luminosity relations are reported. These are compared to the previous calibration and the differences are explained. The status of possible association Cepheids is discussed in light of these new relations. Finally, suggested avenues of future research are outlined.