



THE ^{DAVID} DUNLAP DOINGS

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NEW APPOINTMENT

Dr. Stefan Mochnacki

The Provost has now given his approval to our recommended tenure-stream faculty appointee. He is Dr. Stefan Mochnacki (pronounce the second 'c' as an 's'), who is currently a Research Associate at the D.A.O. Stefan was born in England, but raised in New Zealand, where he obtained his M.Sc. degree from the University of Canterbury. He came to Canada in 1971 and proceeded to a Ph.D. degree from UBC, after which he was for several years a postdoctoral fellow at Cal Tech. His professional interests range from close binaries to computer-controlled electro-optical instrumentation, as well as several other diverse topics. Stefan is married and has a young son. The family is due in Toronto at the end of August, and we extend a warm welcome to them.

VARIED APPOINTMENTS

With Ernie Seaquist leaving for a sabbatical at the VLA, the Department was in need of an acting Associate Chairman, and I'm happy to say that Bob McLaren has agreed to act in that capacity.

Christine Clement returns from her maternity leave on July 1, and has decided to drop to a half-time appointment for the next two years (although, thank heavens, she will still be our Undergraduate Secretary). Don MacRae has kindly agreed to pick up the other half of Christine's appointment, and so will not officially retire at the end of June after all. We look forward to having him around the Department and Observatory for quite some time to come.

On the non-academic side, Gerry Longworth's retirement has enabled us to switch Bill Weller from his three-year fellowship to what we trust will be a permanent staff position.

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CONGRATULATIONS

To Mary Lane who successfully defended her thesis "A Quantitative Spectroscopic Study of the Metallic-Line Stars" (abstract on p. 11) on June 5. Chuck Cowley of the University of Michigan was external examiner. As reported in the last issue, Mary has taken a position as analyst with Infomart.

To Neb Duric who passed his Oral General Examination on June 8.

COMINGS AND GOINGS

Ernie Seaquist goes to Socorro, New Mexico, for a year's sabbatical at the VLA. He and Gloria, Jonathan (12) and Suzanne (10) leave on the 28th of June and will be driving via Chicago and the Rockies. Ernie, though, will be back here from time to time, the first occasion being as early as September.

Recent Observation of 3C303:

Louis Noreau reports

For a long time the optical identification of the radio source 3C303 was not known. Before the advent of high resolution radio interferometers, one was not able to relate the radio emission with certainty to any of the objects in the very crowded optical field. The main contenders are an N galaxy, a quasar and two fuzzy ultraviolet excess objects. On deep optical plates one can see some faint filaments around the galaxies and the other objects. It is the galaxy that is now believed to be the source of the radio emission

The latest extensive study of this area of the sky was undertaken in 1976 by P.P. Kronberg, E.M. Burbidge, H.E. Smith and R.C. Strom. Last fall Margaret Burbidge and my supervisor Philipp Kronberg decided to go further using newly available instruments and techniques. Philipp proposed that I be associated in the project, on the other side, Margaret Burbidge asked Harvey Butcher and I to help. Requests for observing time were sent to the

II. THE OBSERVATIONS

Most of the velocities were measured with a radial-velocity spectrometer attached to the 9682M (2.4 m) coudé spectrograph of the Dominican Astrophysical Observatory (DAO) 1.2 m telescope. This instrument resembles the Palomar 5 m spectrometer. Requests for observing time on the VLA, the night of the 18th. With such a long period of observations we got very good coverage at 20, 6 and 2 cm. Afterwards we began the tedious job of data processing. For three frequencies, it is a lot of work! Phil left early for academic reasons but I stayed on to get all the data on export tapes to make one self-calibrated map at 6 cm. I left on the 28th but with still a lot to do.

The optical part of the observation consisted of 4 nights, divided into two runs, on the Mayall 4-meter telescope at Kitt Peak. During the nights of the 1st and 2nd of May the multiaperture spectrograph had been used. I was present for the second run on the 31st of May and the 1st of June. At that time the so called video camera was used. We took frames at the B,V,R and I bands and also at H-alpha redshifted to the galaxy.

After those two nights, I rented a car and headed back to the VLA to do some more postprocessing of the radio data. I was there only 5 days but with the experience acquired in my previous visit, I was able to do a bit better job than I really expected.

Most of the work can now be done at DA using our own VAX computer and a package of programs exported from NRAO called the AIPS.

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Time Allocation on the 74-inch Telescope

Tom Bolton reports

We have now gone through two rounds of applications and one semester of observing under the new system of time allocation on the 74-inch telescope in which observers are required to submit observing proposals for review by the Telescope Scheduling Committee (Bolton, Fernie, Garrison) twice a year. From my point of view, the program worked well in the first semester, but the material below indicates that the requests approximately equaled the time available. The real test of the program will come in the next semester, when we are oversubscribed by almost 50%. Presumably the situation will be even worse when the reticon becomes available (approx. January 1982).

During the 6 month period January - June 1981, there were a total of 182 available nights. We had requests for 186 nights (102%), but we were only able to schedule 174 nights (96%) because of schedule conflicts. This includes part of 4 nights used for engineering. The remaining time was allocated to Observatory programs. Following is the monthly breakdown of these figures.

| <u>Month</u> | <u>Type</u> | <u>Available</u> | <u>% Scheduled</u> | <u>Requested</u> | <u>Granted (%)</u> |
|--------------|-------------|------------------|--------------------|------------------|--------------------|
| January | 1st half | 28 | 100 | 27 | 104* |
| | 2nd half | 28 | 75 | 18 | 117 |
| February | 1st half | 28 | 100 | 29 | 97 |
| | 2nd half | 28 | 96 | 20 | 135 |
| March | 1st half | 35 | 97 | 32 | 106 |
| | 2nd half | 35 | 60 | 22 | 95 |
| April | 1st half | 28 | 100 | 33 | 85 |
| | 2nd half | 28 | 100 | 38 | 74 |
| May | Full | 35 | 100 | 39 | 90 |
| June | Full | 28 | 100 | 33 | 85 |

* Exceeds 100% because of allocations to observers who did not submit observing proposals or due to over-allocation.

The following table summarizes the time requested for observing and engineering during the second semester in units of nights.

| <u>Month</u> | <u>No. Requested</u> | <u>No. Available</u> | <u>Subscription Rate</u> |
|--------------|----------------------|----------------------|--------------------------|
| July | 35.5 | 28 | 1.27 |
| August | 37 | 35 | 1.06 |
| September | 54 | 28 | 1.93 |
| October | 53 | 28 | 1.89 |
| November | 49 | 35 | 1.40 |
| December | 50 | 28 | 1.79 |
| <u>Total</u> | <u>275.5</u> | <u>185</u> | <u>1.49</u> |

The totals above include requests from twelve observers, some of whom ask for time for more than one project, and three requests for engineering time that total 21.5 nights. The engineering time is to be used to test the drive, test a field flattener on the single stage image tube, and test the reticon. The latter test may start in late July.

Below I have listed the observing programs that have been granted observing time during 1981. The number in parentheses following the program title is the number of nights allocated to the program in the first semester. If there is no number, the application was for second semester time only.

- A. Arellano - A Study of the Pulsation Properties of Small-Amplitude Yellow Supergiants (22.5)
- G. Bakos (Univ. of Waterloo) - Radial Velocities of Visual Binaries (7)
- C.T. Bolton - Three-Phase Diagnostics of Non-Thermal and Binarity Effects in Be Stars (12)
 - Spectroscopic Studies of Binary and Variable Stars (4)
 - Line-Profile Variations in Helium-Rich Stars (-)
- R. Crowe - High-Dispersion Spectroscopy of Long-Period Variables (13)
- N. Evans - Spectroscopic Observations of Cepheid Variables (16)
- R.F. Garrison - Testing Prime Focus CFHT Spectrograph (-)
 - Solar Spectrum Via Asteroids
- R. Gauthier - Near Infrared Spectra of Cepheid Variables (15)
- D. Gies - The OB Runaway Stars (37)
- D. Gies and C.T. Bolton - Rapid Line Variability in HDE 226868 (Cygnus X-1) (-)
- K. Kamper - Astrometric - Spectroscopic Binaries (11)
 - Slitless Spectroscopy of Expanding Nebulae (-)
- J.B. Lester - Am Stars in Open Clusters (-)
- R. Lyons - Spectroscopic Observations of Binary Stars (includes some time for joint programs with D. Turner and C.T. Bolton) (13.5)
- D. Turner - Spectroscopic Observations of Stars in Clusters and Associations (12)

THE CASCA MEETING ETC.

A large contingent travelled to Quebec City late last month to attend the CASCA meeting and associated functions at Laval. These included *Tom Bolton, Charles Dyer, Bob Garrison, Phil Kronberg, Bob McLaren, Louis Noreau, John Percy, Raymond Rusk, Ernie Seaquist, Bill Weller, and Joan Wrobel* (enroute between Charlottesville and Algonquin Park). The papers presented were

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|----------|--|
| Dyer | "Optical Properties of Realistic Gravitational Lenses" (invited review) |
| Garrison | "Teaching 'Life on Other Worlds'" |
| Kronberg | "M82 - A Superb Laboratory for Star Formation Bursts" (co-authors P. Biermann and F.R. Schwab) |
| McLaren | "The Cepheid Period-Luminosity Relation - A new Application of Infrared Photometry" (co-authors R. McGonegal, B. Madore, C. McAlary) |
| Percy | "Pulsating Be Stars?" |
| Seaquist | "The Nature of Some Compact Radio Sources in or Near Supernova Remnants" (co-author B. Gilmore) |

Bob Garrison arrived early to attend the meeting of the CASCA Council and stayed on till Saturday, with McLaren, Percy and Bolton to attend the meeting of the Associate Committee on Astronomy. The CLBA Planning Committee (Ernie's Army) also met on the Saturday.

MLr

Pulsating B Star Workshop In Nice

John Percy reports

I was in Nice, France (on the Côte d'Azur) June 1-5 for a Workshop on Pulsating B Stars. The Workshop was held as part of the centenary of L'Observatoire de Nice, and was attended by about 50 astronomers from 15 countries. John presented invited papers on "Evolutionary States" and "Instability Mechanisms" and contributed papers on "Photometric Variability of B Supergiants" and "Short-Period Photometric Variability of Be Stars". L'Observatoire de Nice is a large, active observatory with a spectacular view of the city (and vice versa). Its most impressive instrument is a 74-cm refractor, in a beautiful dome by Eiffel. This instrument is still used regularly for double star observations. There are also several smaller telescopes, a PDS, and excellent computing facilities.

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June Institute 1981

While John Percy was in Nice (see above), the product of his well-laid plans - the 1981 June Institute - was unfolding smoothly back here in Toronto. This year the programme was scaled down to three lectures from each of the three speakers, and it appears that almost everyone prefers the new format. Bob Kirshner (Univ. of Michigan) gave two lectures on Supernova Explosions and one on The Large-Scale Distribution of Galaxies. Scott Tremaine (MIT) discussed Resonances in the Solar System including an explanation for the peculiar properties of the rings of Saturn and Uranus. Bruce Elmegreen (Columbia) gave a comprehensive review of Molecular Clouds and Star Formation in the Galaxy.

The welcome party hosted by Barry and Katherine Madore on Sunday night and the GASA buffet dinner and party on Tuesday night provided lots of opportunity for socializing.

The attendance by visitors - 30 individuals from 14 institutions - was very encouraging and a good sign for future June Institutes!

MLr

P O T P O U R R I

Bob Garrison, our Graduate Secretary, has been appointed to the Executive Committee of Division III - The Physical Sciences, in the School of Graduate Studies for the 1981-82 session.

Bob McLaren, Doug Welch and Peter Brogden took the Infrared Photometer to L'Observatoire Astronomique de Mont Mégantic for a 7-night observing run June 16-22. Unfortunately the weather did not cooperate, providing only a few hours of clear sky. The photometer did receive a good check-out on the larger telescope however.

Tom Bolton has agreed to become a Vice-President of the Toronto Centre of the RASC, replacing Ernie Seaquist.

Ron Lyons is just back from a two-week hiking and bird-watching tour of northern Scotland and the Orkneys. Lynda accompanied him and is staying on for a bit longer.

CLBA

This is the new name for our hoped-for transcontinental radio telescope - the Canadian Long Baseline Array. Ernie Seaquist is Chairman of the Planning Committee and will continue in that capacity during his sabbatical at the VLA in the coming year.

On June 18, the Planning Committee met at the University of Toronto with representatives of several Canadian companies. The purpose was to inform Canadian industry about the array and to discuss the means by which industry could best contribute to the design study. It was clear that Canadian industry is very enthusiastic about the entire project, and that several companies are eager to participate in the design study and also of course in the construction.

The next meeting of the full CLBA Planning Committee will take place in Vancouver on July 29 and 30.

PAPERS SUBMITTED

| | |
|--------------------------|--|
| B.F. Madore | The Period-Luminosity Relation. IV. Intrinsic Relations and Reddenings for the LMC Cepheids. |
| D.A. MacRae | CORAVEL Radial Velocities of an Am Star. |
| J.R. Percy | Photometric Variability of B-type Supergiants: A Preliminary report. (Presented at a Workshop, Nice, France, June 1-5, 1981) |
| J.D. Fernie | Yellow Supergiant Reddenings from BVRI Data |
| R.F. Garrison | Teaching "Life on Other Worlds" |
| C.C. Dyer R.C. Roeder | Simulating the Transparent Gravitational Lens |

NO JITNEY

With Gerry Longworth gone, there's no one to make the regular once-a-week run to and from DDO and DA. Everyone going from one place to the other is requested to check around before leaving in case there is something in need of delivery (including the suitcase, of course).

PDS Annual Report for 1980-81

The following is excerpted from the second annual report on the usage and budget of the PDS microdensitometer system. After the experience gained last year, it has been possible to improve the record keeping system so that I can provide more detailed statistics, and we now have a baseline to identify trends in usage. The major event of the year was the dramatic increase in usage, documented below. This was primarily two-dimensional scanning. It forced us to begin implementing the data processing programs on other computing systems. The speed of this process will depend on the availability of appropriate hardware (e.g. graphics terminals) and personnel to do the software. Nonetheless, this work should be substantially complete by the end of the 1981-82 fiscal year.

The HP 2647A Intelligent Graphics Terminal was fully integrated into the system during the 1980-81 fiscal year, but we are still modifying software so that we can fully exploit the capabilities of this instrument. Nonetheless, it has speeded some of the data processing, and reduced our use of consumable supplies. We have also ordered two replacement components, an A/D converter and a DECWRITER IV terminal to replace our obsolescent DECWRITER I. The terminal has been delivered and should be installed by the time you read this, and the A/D converter should be installed by the end of 1981. Both components, especially the A/D converter, should produce substantial improvements in system performance.

A total of 3783.5 hours of machine time was used during fiscal year 1980-81. This is an increase of 27.4% over the previous year, and it represents 43.2% of the total time available, calculated on the basis of 365 twenty-four hour working days per year. The machine was unavailable because of hardware problems only 1.9% of this time. The table below shows the distribution of time used among the various faculty members supervising the work. The students involved and their percentage of the overall total are shown underneath the sponsors name, and the corresponding figures for the 1979-80 fiscal year are shown in parentheses after the 1980-81 figures.

PDS Usage - April 1980 through March 1981

| <u>Sponsor/User</u> | <u>Percent Total</u> <u>1980-81 (1979-80)</u> |
|--------------------------------------|--|
| Kamper | 20.61 (6.5) |
| Bates - 1.48 | |
| Fullerton - 3.82 | |
| Visitors | 19.49 (21.0) |
| Bolton | 17.51 (31.6) |
| Box - 1.79 | |
| Bates - 2.98 | |
| Gies - 1.64 | |
| Lyons - 0.80 | |
| Thomson - 2.47 | |
| Software Maintenance and Development | 13.13 (12.8) |
| Garrison | 12.64 (1.5) |
| Crowe - 1.26 | |
| Corbally - 8.13 | |
| Gauthier - 3.26 | |
| Percy | 11.30 (17.5) |
| Arellano - 1.74 | |
| Evans - 3.91 | |
| Fraquelli - 5.66 | |

| | |
|---------------------------------|------------|
| Other (Weller, Turner, McAlary) | 1.85 (1.6) |
| Coutts-Clement | 1.26 (0.5) |
| Madore | 0.92 (1.5) |
| Kronberg | 0.70 |
| MacRae | 0.58 (5.9) |
| | <hr/> |
| | 99.99 |

The following table summarizes our operating budget for the past two years and gives an estimate for the current year.

| <u>Item</u> | <u>1979-80</u> | <u>1980-81</u> | <u>1981-82 (est.)</u> |
|--------------------|-----------------|-----------------|-----------------------|
| Operating Expenses | \$17,158.19 | \$16,463.21 | \$19,650.00 |
| Income | | | |
| CORE grant | \$12,000.00 | \$13,176.00 | \$14,494.00 |
| Operating Grants | <u>6,545.19</u> | <u>3,287.21</u> | <u>5,156.00</u> |
| | \$17,158.19 | \$16,463.21 | \$19,650.00 |

In addition, more than \$4,000 was spent on new equipment in 1980-81. This money was drawn from a variety of sources. The operating expense is high in 1979-80 and low in 1980-81 because we used surplus funds to buy substantial quantities of spare parts and consumable supplies in 1979-80. The income from operating grants estimated for 1981-82 is partly wishful thinking. The commitments made so far fall more than \$1,000 short of our estimated requirements.

Bln

ELMSLEA

Now that Observatory House is well into its 120th year, the Marsh family, who built and owned the house until the University acquired it, have renewed their interest in the old place (which, incidentally, they know as "Elmslea", or more affectionately as just "The Lea"). On Sunday, June 14, Don and Yvonne Fernie hosted a family reunion of some eight car-loads of Marshes and Gibsons (of Gibson House, Willowdale, fame, the two families being closely intertwined). Participants ranged in age from perhaps five to ninety, with a surprising number of the older ones having lived in the house as children or young people. Memory, of course, played all the usual tricks on them. So the staircase doesn't sweep up, eight feet wide, after all, and the living-room isn't quite ballroom-size either ... But there were many happy recollections of children's games in the attic on rainy afternoons, and life on the farm in horse-and-buggy days. Indeed, the family's pleasure in seeing through the old homestead again made all the preparations more than worthwhile. Besides, knowing that a group will want to roam one's house from basement to attic provides a wonderful spur to spring cleaning!

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THESIS ABSTRACT

"A Quantitative Spectroscopic Study of the Metallic-Line Stars"

Mary Lane

We have undertaken a study designed to determine, as accurately and as consistently as possible, the physical properties of a group of metallic-line stars. We have obtained observational data that are of higher resolution and that cover a wider spectral range than have any previous authors. Our analysis has been carried out with the most sophisticated methods available, including line-blanketed model atmospheres of differing composition and spectral synthesis techniques.

We observed the Am star 81 Tauri to undergo a transient change in its energy distribution over a period of five days. It appears that several other Am stars have displayed this sort of phenomenon in the past and it may be more common than has previously been believed. We have determined effective temperatures and surface gravities for our programme stars by comparing our observed energy distributions to fluxes calculated from model atmospheres that have line-blanketing which reflect solar, three times solar and ten times solar abundances. The theoretical fluxes calculated with the three times solar models provide the best fit to the observed energy distributions and are consistent with the surface gravities determined from the ionization equilibrium of iron. We have used these models to synthesize the Ca K line profiles in our stars and for suitable calcium abundances, the match between theory and observation is excellent.

We have calculated the radii of our programme stars and find them to be similar to those of normal A-type stars of the same effective temperature. The radii are thus consistent with normal main sequence gravities. We have determined the rotational and microturbulent velocities of these stars using spectral synthesis techniques. The rotational velocities are small and similar to those determined by other authors. The microturbulent velocities are much smaller than those determined by the classical curve-of-growth techniques. This results in a microturbulent scale for Am stars similar to that for normal A dwarfs.

We have used spectral synthesis techniques in combination with high resolution International Ultraviolet Explorer Satellite spectra to investigate the abundances of the lighter elements, many of which cannot be studied in the visual. We find nitrogen to range from slightly overabundant in the cooler Am stars to slightly underabundant in the hotter Am stars. Carbon is underabundant by almost a factor of two, aluminium is solar, phosphorus is fifteen times overabundant and silicon ranges from solar to ten times overabundant.

We have investigated the helium abundance in Am stars and find some evidence that it may be temperature dependent. If this is true, helium may be far more deficient, by up to a factor of thirty, in the coolest Am stars than has previously been believed. When our abundance calculations are carried out with helium deficient models, there are small changes in the abundance of some of the lighter elements in the sense that they become more solar.

We have compared the results of our abundance determinations to the published results of diffusion theory. The process is somewhat confusing and our results are not conclusive. Many of the tests we have performed support diffusion theory, some do not. Finally, we have combined our data with those of Heacox (1979) for the Hg-Mn stars. We have found substantial observational evidence for a connection between these classes. We believe that they form a continuous sequence of non-magnetic peculiar stars.