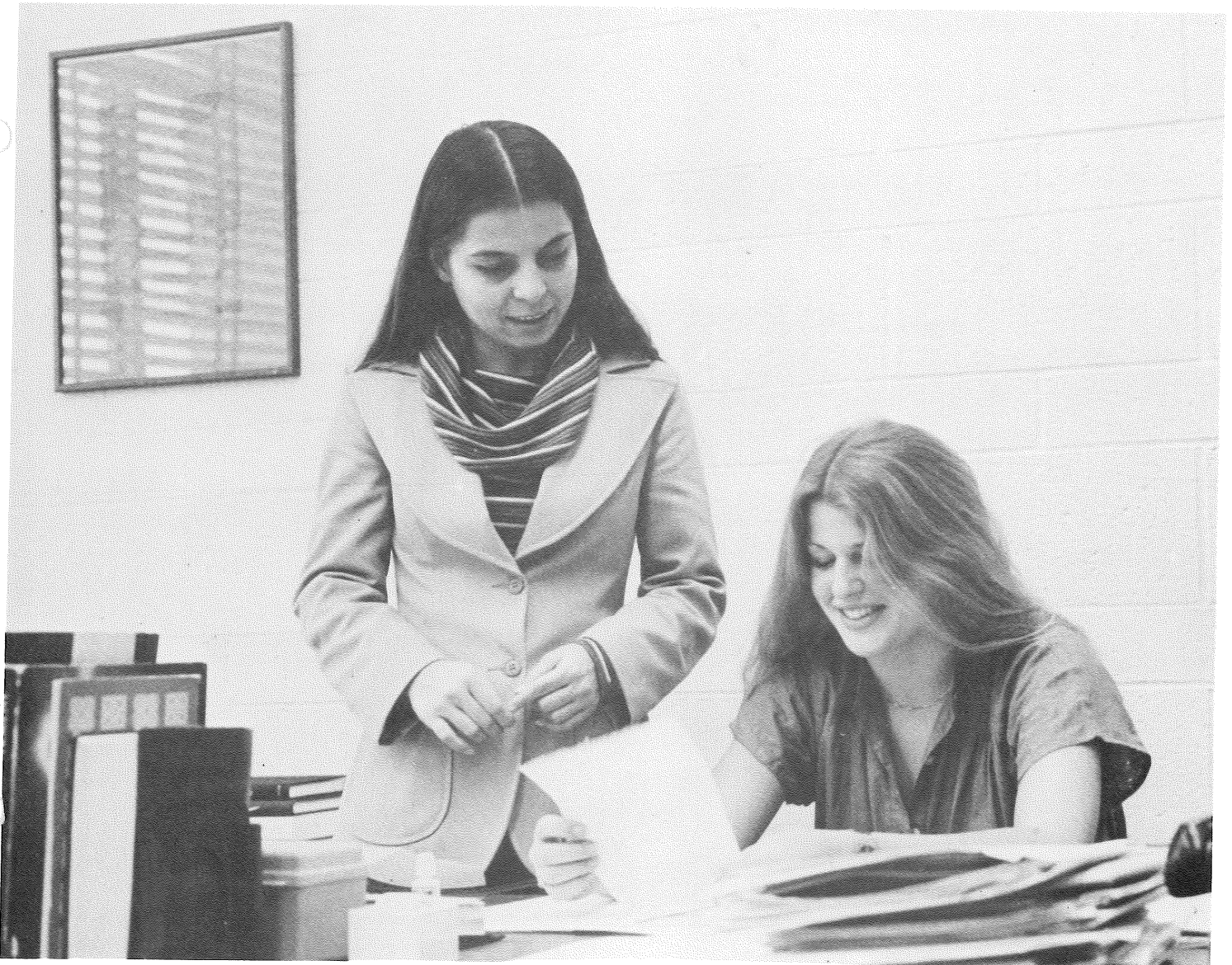


DAVID DUNLAP DOINGS

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Cover: pp. 2 and 4

(Photo - Courtesy of Dennis Crabtree)

Cover

It's easy for most of us to recognize the two supergiant secretaries whose radiance keeps the Department glowing. But to some of our readership their faces may be unfamiliar. That's Pamela Sullivan (left) discussing a fine point of a manuscript with Gale Archer. See Comings and Goings (page 4).

We finally got it straight

Photographs show that on opening day (May 31, 1935) the 74-inch dome shutters were positioned straight above the door, but within a week the telescope was regularly parked on the west side and the dome took on its long-familiar skewed appearance, as if to avoid an unpleasant odour from the east. Straight ahead is the norm now, as Tom Bolton tells us on page 3 in his item about what's new with the work-horse of Richmond Hill.

Things are looking up

at Las Campanas, as Bob Garrison reports in this first of a regular series on our southern hemisphere observing station (page 4).

Upstairs, downstairs

From time to time the Editors plan to run articles on the activities of the DDO support staff. This month we present the first such review, written by Tom Bolton (page 5).

The tribe

Dot Fraquelli reports on the summer antics of the natives (page 7).

Physical Science Saturday

After a somewhat disappointing turn-out last year, the Physical Science Saturday crowd bounced right back, as Christine Coutts Clement reports on page 6.

AND MUCH MUCH MORE

Published at the David Dunlap Observatory, Box 360, Richmond Hill, Ontario L4C 4Y6

Editors: Donald A. MacRae and Robert A. McLaren

THE BIG EYE

The 74-inch telescope became operational in late August following more than 3 months of downtime to install improvements on the spectrograph. Observing has been more or less routine since that time although there is some work still underway. The telescope was down longer than expected because we ran into some unforeseen problems. The shop personnel did a tremendous job to get the work done as quickly as they did.

I owe special thanks to Karl Kamper, who supervised almost all of the optical work. Without his untiring and patient efforts the spectrograph would probably still be lying around in pieces. Thanks also go to Harvey Richardson, Murray Fletcher, and Roy Dancey at DAO, who helped with advice and labour at various points throughout the process.

After the removal of a few bugs, the new mechanical and electrical modifications to the spectrograph have performed well. With the image slicers we have obtained substantial speed gains compared to our old system, but it is too early to be quantitative about this. According to Nancy Evans the radial velocities obtained from the new spectrograms are excellent. The systematic error is $-1.5 \pm 0.5 \text{ km s}^{-1}$ and should improve.

Our major remaining problem is the optical alignment of the image slicers. The comparison, but not the stellar, spectrum shows a number of aberrations which vary between the two slicers. It appears that the problem is in the internal alignment of the image slicer optics. We are seeking advice on this before proceeding.

We have also encountered some focus problems that we did not have before. The new collimators are much faster than our old system. As a result, the focus of the camera is more critical. We have been having trouble getting a consistent focus during the night. After several tests, we have traced the problem to the plateholders and plateholder assembly. The present system can allow the position of the plate to vary by up to $0''.005$ depending on how tightly the plateholder is clamped. The system is being modified to get around this problem.

We have also had some problems with the red collimator. The small mirror has a crack (repaired) in the back which has reduced its optical quality. In addition, the enhanced silver coatings used to improve the red reflectivity have been seriously damaged by H_2S emissions from York Block on Yonge Street. We will have to return to aluminum coating (lower reflectivity) or use gold coatings (almost no reflectivity below 5800 \AA).

There are a number of changes planned for the 74-inch in the near future. I will discuss these in the next issue. Two important changes have already been made. A large instrument storage cabinet has been placed on the east side of the north pier. This will be used for storage of cameras, gratings, collimators, etc. when they are not in use. The contacts for the dome rail heaters have been moved farther east so that the dome can be stowed with slit pointing almost due south. This permits easy access to the platform stairs from the west stairs to the catwalk. Jim Thomson also thinks it will mean we will no longer have to sweep snow off the top of the telescope.

A number of observers have reported difficulties with "lumpy" calibration curves when using calibration plates obtained with the spot sensitometer. We have been unable to find any problem with the spot sensitometer, but we have found that the photoelectric calibration device has a noisy phototube. This could account for the problem if the original calibration of the sensitometer was distorted by the bad tube. We are awaiting delivery of a new tube so that we can check this possibility.

COMINGS AND GOINGS

This month we welcome Gail Archer (see cover) to the DA office. Gail is originally from New Jersey but has lived in Toronto for most of her life. She completed Grade 13 at Notre Dame High School (in the Beaches) in spring 1977 and spent the past academic year polishing her secretarial skills at Eastern School of Commerce. Gail joined our secretarial staff on November 1.

LAS CAMPANAS NEWS

As the University of Toronto 61 cm reflector on Las Campanas in Chile settles slowly into what we confidently believe will be a relatively trouble-free phase of operation, the editors of DDD are aware that readers don't hear as much about it as they did when it was in the "one crisis after another" phase. We therefore decided to ask Bob Garrison to produce frequently if not monthly a short item summarizing advancements and achievements.

For 7 years, we have been operating a 61 cm telescope at a very remote station in the mountains of North-Central Chile. The operation has been extraordinarily productive in terms of research per square centimeter, probably more so than any other telescope anywhere. True, there have been rugged conditions at times, but we have kept the telescope going through incredible difficulties and with very few nights lost due to complete failure. Sometimes the equipment has been held together by little more than the ingenuity of a Canadian Astronomer or a Chilean worker using a bent barrel-cactus needle, but it has been kept operational. It shows what can be done at an excellent site with even a small telescope if we work hard enough, believe in what we are doing, and use imagination instead of depending on a large collecting area as a brute force substitute. But, if only we had a 2 meter telescope ...

Most of the chronic problems which puzzled us for years have been solved. In the early days, power instability was the dominant problem and we now realize that it was also a major contributor to our frequency of repair record. A battery buffer and inverter were introduced four years ago, and we now have only 10% of the previous repair record.

A second major problem was the alignment shift between the main mirror and the finder. We finally isolated the problem and rebuilt the main mirror cell, thus reducing the shift for extreme positions in the sky to less than 20 seconds of arc.

The drive has been slowly improved, first by installing a new variable-frequency drive system, then by adjusting the bearings, and just this fall by readjusting the sine corrector, all of which has improved the tracking considerably. At the present time, Tony Estevens is designing a new corrector-feedback system for the drive which should give 1 sec of arc stability over a period of hours.

The console relays, always a source of irritation, are being gradually rewired and replaced by easily accessible, heavy-duty plug-in units.

The photometer, which has gradually deteriorated as a result of heavy use over the years has just now been replaced by a new one designed by Don Fernie and built by Dave Blyth in the DDO shops. It has been shipped and will arrive on the mountain sometime in late November. For those of you who have suffered with the old one for the past few years, the new one will be a marked improvement.

There are many other improvements, too numerous to be listed; highlights are a car provided by CARSO for the use of U. of T. observers, the new Carnegie Lodge (complete with a chef stolen from the Hotel Berlin), rewiring of the heaters in the house, etc.

In the new year, we plan to remove the inverter system from the dome in order to get rid of a major heat source there and thus improve the seeing. A small building to house it has been built into the side of the mountain near Casa Canadiense.

A new vacuum oven has been purchased and will be shipped within a few months. We are planning to use "forming gas" eventually, but it will take some time to build plate storage boxes.

Last, but certainly not least, we have received official authorization from the Chilean government to operate a radio between Toronto and Chile. A few details still have to be worked out, but we should have an operating radio at both sites within 6 months. This has been a long, complicated fight, but persistence has paid off and we are now the only observatory which has gone the proper, legal route to a radio link.

A bit of exciting research news to close off the column for this month: in September, a blue spectrum was obtained of Seaquist's new radio star SS433, whose blue magnitude turns out to be fainter than 16th! It is an extremely red early-type star with P Cygni profiles on the hydrogen lines. And we did it with the image tube spectrograph on a measly 61 cm telescope. True, the widening was only 0.1 mm, but we got it. Again, I say: "If only we had a 2 meter telescope in Chile".

rG

NUTS AND BOLTS

There are several major projects now in the workshop and several more waiting in the queue, and the work load is very heavy. It will be at least 18-24 months before the machine shop can undertake any major new projects. In the meantime, Archie Ridder has moved into the machine shop on a full-time basis to help meet the demand.

The following is a brief list of the larger projects now underway in the shop. I will take some of these up in more detail in later months as well as describing those projects that are waiting in the queue.

Many of you are aware that DDO received the contract to build the polarimeter for the CFHT. Dave Earlam began work on the mechanical parts this summer. We expect that this project will occupy a large portion of the shop time through 1979. Dave Blyth has finished one of the new twin photometers. It is now being tested on the 19-inch telescope in preparation for shipment to Chile. The second one, which is destined for the 19-inch, should be completed in the near future. We hope that Dave can begin work on John Lester's echelle spectrograph in early January.

Archie Ridder is working on a number of items for the 74-inch telescope that are left over from or have arisen out of this summer's modifications to the spectrograph. At the moment he is building modifications to the plateholders and plateholder assembly for the f/5 camera in an attempt to cure the unstable focus problem that we have encountered.

Gerry Longworth has been busy in between his other duties trying to aluminize lens slits for the 74-inch spectrograph. This involves aluminizing slit jaws onto the convex side of half inch diameter lenses. The slit jaws must be parallel, separated by the correct distance, and the aluminized part must be free of pinholes. This has proved to be even more difficult than it sounds. However, Gerry has succeeded with the two narrowest slits, and the remaining six should be done shortly.

Tony Esteveas has begun work on the design of a real-time interactive sine corrector for the drive of the Las Campanas 24-inch telescope. Frank Hawker is building the digital read-out for the digitization system for the Grant measuring engine. Larry Morrill is spending most of his time debugging and improving the electronics systems on the 74-inch telescope.

In addition to the major projects mentioned above, there are a number of minor, but important, projects also underway, and the shop staff continue to carry out normal maintenance and emergency repairs on the telescopes and instruments on a priority basis.

Last, but not least, I should note for the record that Bruce Campbell was here during the week of November 13. He worked with Tony and Al Irwin and what at times seemed like a cast of thousands to get the Reticon system working once again. I'm told these labours were a complete success.

Bln

PHYSICAL SCIENCE SATURDAY

Physical Science Saturday was held on November 18th. This is the annual occasion when high school students have an opportunity to visit the 7 physical science departments of the Faculty of Arts and Science, and about 500 people attended. On hand to greet them when they visited the Astronomy "Open House" were Christine Clement, who organized the event, Maurice Clement, Bob Garrison, Bob McLaren, Chris Corbally, Dennis Crabtree, Lindsey Davis, Douglas Gies and undergraduates Petrusia Bojetchko, Neb Duric, Wendy Freedman, Do-Ming Lum, Alfred Stulginskas, Tom Wells and Linda Zimmerman. The activities included a spectroscopic display, a tour of the infrared lab, and a demonstration of "How to Build a Stellar Model in Your Office". In addition, the 16-inch and 8-inch domes were open for inspection and the Questars were set up on the 15th floor balcony. It was cloudy (not surprising for November!), but the Questars did provide an excellent view of the College Bowl Game in Varsity Stadium.

INDIANS AND CHIEFS

The 1978 Summer Visitors' Program was a great success. The tours ran from Wednesday, April 12 through Saturday, October 28 and saw almost 4000 people visit the DDO. In addition, 100 RASC members and over 650 residents of Richmond Hill came to see the observatory on special nights set aside for them.

1978 also saw the inauguration of a new organizational structure for the tours. In the past, there were three tour leaders (chiefs) and anywhere from six to twelve assistants (indians). Each week one chief and two indians would work the Saturday tours. The Wednesday tours were conducted by the chiefs alone. The system worked as long as there were several senior students involved in the tours.

In 1976 the old system started to break down. There was only one senior student involved in the tours at the chief level with the result that we had second year students chiefing. The prospect of having these few young chiefs control the tours for 2-4 years generated dissention in the ranks.

1977 was the last year that the traditional chief and indian system was employed. At the end of the 1977 tours season, it was apparent that the continuation of the system would deny the chiefing experience to more than half of the interested students.

Acting on the premise that chiefing is an experience that all students should have, the following structure was set up. There would still be two job classes for the tours. The indian position would continue as in the old system. The second position, titled chief/indian, would incorporate both the old chief and the indian positions. The responsibilities of the chief/indian depended upon which role was being filled. The old chief duties were assigned to the chief role, and the regular indian duties to the indian role. The change allowed six chief/indian positions for the 1978 season (all the qualified and interested parties).

The structure change produced some unexpected benefits. First, the chief/indians were not tied to the every-three-weeks syndrome. No one chief/indian had more than four Saturday tours to work as a chief. All of the former chiefs found that for the first time they enjoyed giving the late season tours. They were not bored or jaded as in previous years. As a result, we feel the public received better, more interesting tours than at any other time in the recent past.

Second, communication with the indians improved dramatically. Since the chief/indians also worked as indians, they were directly reminded of how difficult it is to find an eleventh magnitude object with the sun still up.

Finally, everyone had a chance to regularly do each job involved in the tours. The chief/indians learned to appreciate their indians more. As well, they gained experience by meeting the public in the two different roles.

In summary, the new organizational set-up for the summer tours worked well in 1978. The chief experience was shared among six people instead of three, resulting in fresher, more interesting tours for the public. In addition, the sharing of the indian duties among all 13 of the chief/indians and indians resulted in enhanced communications and understanding between the chiefs and indians.

Fqi

Superchief 1978

P O T P O U R R I

Just too late to be headlined in the last issue of DDD we learned the happy news that *Sidney and Gretchen van den Bergh* were married in a quiet ceremony in Victoria. Their address is 418 Landsend Road, Sidney (*sic*) British Columbia.

We have been remiss in not mentioning previously that *Alan Irwin*, his thesis finally completed, is now working half-time for *Peter Martin*. His job is to coordinate software development for the NOVA computer on the 24-inch at DDO. He is devoting the other half of his time to publication of his thesis results and to further pursuit of his own research. The abstract of Alan's thesis appears on page 10 of this issue.

In other Irwin news, *Alan* reports that *Barbara* has just been appointed head of periodicals in the Science and Technology section of the Metro Toronto Library.

Peter Pesch, Director of the Warner and Swasey Observatory and wife *Donna* came to Toronto for their Thanksgiving holiday spending November 22-24 in the Department. Peter gave a colloquium entitled "Motions of Late-Type Dwarfs".

Bruce Campbell was back at DDO during the week of November 13. After helping to get our Reticon functioning once again, he described some of his own recent work in determining "Precision Radial Velocities" using Reticon spectra.

Martine Normandin spent two weeks in California during the past month visiting Berkeley, Caltech, and giving a talk to Smoot and Muller's group at the Lawrence Berkeley Lab. Martine leaves December 2 for Bonn where she will join *Phil Kronberg* for a 10-day observing run on the 100-m dish. Enroute to Bonn, Martine will stop in Paris and give a talk at the Centre d'Etudes Nucleaires de Saclay.

Barry Madore had an 8-night observing run on the CARSO 40-inch at Las Campanas during November and reports 8 nights photometric.

Chris McAlary was at KPNO November 16-27 making infrared observations on the McMath Solar Telescope in collaboration with *Al Betz* of U.C. Berkeley.

Peter Martin (on sabbatical) passed through Toronto November 17 and 18 enroute from Cambridge to Tucson. While in town he got a progress report from the DDO shop on the CFHT polarimeter and had a chance to consult with graduate students *Jose Maza* and *Bjarne Everson*. He also touched base with programming assistant *Alan Irwin*.

Don Fermie gave a talk on "Current Cepheid Research" to the Niagara Falls Centre of the RASC on November 10.

Ernie Seaquist addressed the London Centre of the RASC on "Radio Supernova Remnants" on November 17.

John Percy gave a pair of lectures on "Contemporary Astronomy and its Application in the Classroom" at the 1978 Conference of the Science Teachers Association of Ontario November 2-4. *Dorothy Fraquelli* and *John* hosted a visit of about 40 teachers to the DDO on November 4.

Dennis Crabtree has been named by the Graduate Assistants Association as Union Steward representing graduate student employees at DA.

PAPERS SUBMITTED

P.M. Teillet	Differential Rotation and Meridional Circulation in Stellar Atmospheres
B.F. Madore and H.C. Arp	Three New Faint Star Clusters
H.B.S. Hogg	Variable Stars in Galactic Globular Clusters
D. Fernie and D.G. Turner	Is the Cepheid Zeta Geminorum a Visual Binary?

COLLOQUIA*

* Unless otherwise noted, colloquia are held on Wednesdays at 4:00 P.M. in Room MP 137 with TEA at 3:45 in the Reference Room, MP 1404.

December 6	Dennis Crabtree, University of Toronto "Circumstellar Dust Envelopes: Calculation of Eclipse Light Curves and Fringe Visibilities"
December 13	Mary Lane and Chris Rogers, University of Toronto G2000 - Current Literature Seminar
January 9 (Tues.)	Shyam Jakate, University of Toronto "Search for Beta Cephei Stars" (TBA at DA)
January 10	Lindsey Davis and Rick McGonegal, University of Toronto G2000 - Current Literature Seminar
January 11 (Thurs.)	G.W. Wetherill, DTM Carnegie Institution "Accumulation of the Terrestrial Planets" (Joint-Astronomy-Physics, Room MP 102 4:10 P.M.)

*** 1979 SNIDER VISITING LECTURER AT ERINDALE ***

DR. OWEN GINGERICH

HARVARD UNIVERSITY AND SMITHSONIAN ASTROPHYSICAL OBSERVATORY

January 23 (Tues.)	"The Copernican Revolution: Crisis vs. Aesthetic" (Med. Sci. Auditorium 4:00 P.M.)
January 24 (Wed.)	"Was Ptolemy a Fraud?" (Rm. 2074, Erindale South Building, 4:00 P.M.)
January 25 (Thurs.)	"Smashing the Spheres: A 16th Century Detective Story" (Rm. 2074, Erindale South Building, 8:00 P.M.)

THESIS ABSTRACT

Alan Irwin completed his Ph.D. requirements in August. The abstract of his thesis appears below.

"AN OBSERVATIONAL AND THEORETICAL STUDY OF MK CLASSIFICATION CRITERIA FROM G5 TO K5"

Alan William Irwin

The observational and theoretical variations of the MK classification criteria were investigated for the range of spectral types from G5 to K5. 55 stars were selected (mostly from Keenan's list, Morgan and Keenan, 1973) for this study. 12 A/mm plates of these stars and the moon (as a substitute for the sun) were taken with the Cassegrain spectrograph of the David Dunlap Observatory, 74-inch telescope. The plates were scanned with the Observatory PDS microdensitometer and reduced to relative flux as a function of wavelength from 4000 to 4400 Å. These spectra were convolved with a 2 Å FWHM Gaussian and normalized by a straight line fit.

The programme stars were classified by comparing their normalized spectra with those of the MK standards (Morgan and Hiltner, 1965, Morgan and Keenan, 1973). The derived temperature subtype and luminosity class are reasonably consistent with Keenan's results. However, our CN strength classifications differ considerably from each other. Because of this inconsistency, the possibility that the CN anomalous stars are spectrum variables should be investigated.

The theoretical comparison of the MK classification criteria was accomplished using the method of spectrum synthesis. A computer programme (SSYNTH) was designed to calculate synthetic spectra efficiently while still allowing the Doppler broadening velocity (DBV) to be variable with both depth and species. This allowed spectra with small or zero microturbulence to be calculated properly.

Physical data necessary for calculating synthetic spectra between 4000 and 4400 Å have been selected from the literature. In addition, published wavenumbers of a number of bands of CH, SiH, and CN were analyzed to determine the molecular constants. These constants were used to predict the molecular line information needed for the synthetic spectrum computations.

A central intensity solar spectrum, a flux solar spectrum, and a solar abundance grid of synthetic flux spectra were calculated with SSYNTH from 4000 to 4400 Å. The parameters of the grid ranged from $T_{\text{eff}} = 3500$ to 6000 K, $\log g = 1.$ to 5., and microturbulence = 0. to 4. km/s. The central intensity solar spectrum was compared with the Kitt Peak Solar Atlas, and the flux solar spectrum was compared with the moon's spectrum observed in this work. Adequate agreement between the theory and observation was obtained in both cases.

In general, the changes in the theoretical MK temperature type and luminosity class with T_{eff} and $\log g$ are qualitatively correct for the grid models. Variations with the microturbulence affect the MK criteria to a certain extent, but there are no large qualitative changes.

There are a number of discrepancies which show up as a result of the quantitative comparison of the grid models and the observations. These discrepancies are largest for the coolest atmospheres. Until these discrepancies are resolved, quantitative analysis of the low resolution spectra classified in this work will be inaccurate.

CHRISTMAS HIATUS

In keeping with tradition, the *David Dunlap Doings* will not be published in December. This is to avoid any possible confusion with that scurrilous rag, the *David Dunlap Droppings*. The *Doings* will return in January with all the news fit to print (and which gets to us by the deadline).

The Editors