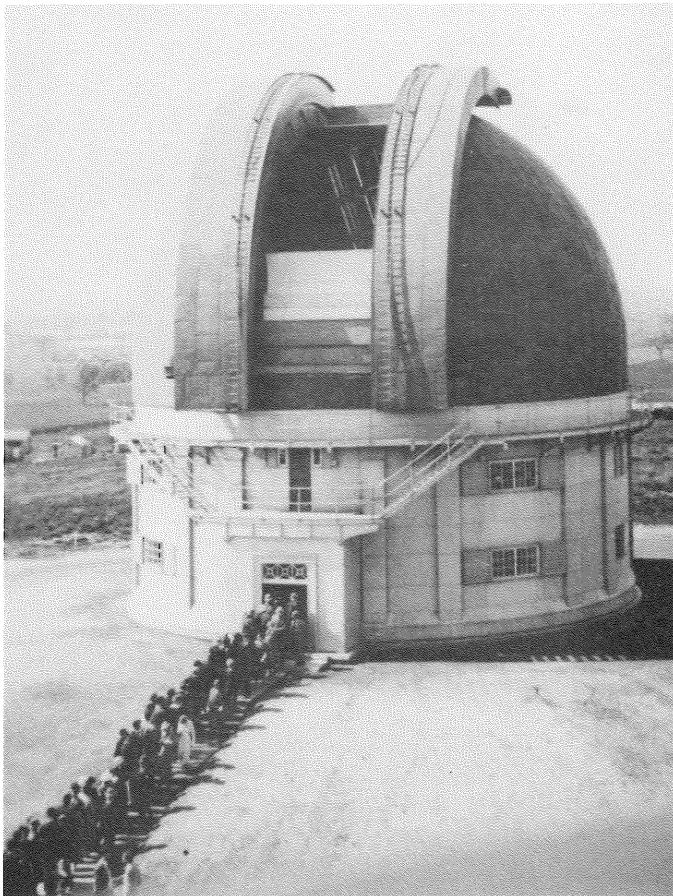


THE ^{DAVID} DUNLAP DOINGS

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The Bimonthly Newsletter of the David Dunlap Observatory



Special Issue on the Occasion of the Fiftieth Anniversary of DDO

INTRODUCTION

The David Dunlap Observatory was officially opened on May 31, 1935. This year, a variety of events are being held to celebrate the fiftieth anniversary, culminating with the CASCA 1985 meeting from May 27-31, and a "birthday party" with ceremony and open house on May 31. This special issue of the *Doings* has been prepared for that occasion. It is specifically addressed to the Canadian astronomical community, to our colleagues at U. of T., as well as to our regular readers far and wide. It briefly describes the current status of the many aspects of the Observatory's work.

Thanks to support from the President's Office, the Faculty of Arts and Science, and University College, we have also prepared a Commemorative Booklet, aimed at a more general audience. This booklet is based heavily on a lecture given by Don Fernie to the Royal Canadian Institute this spring. Any of you who would like a copy, but have not yet received one, should write to me.

Because of the fiftieth anniversary the public relations spotlight will be on the Observatory for most of the year. We have already been written up in several publications including the *University of Toronto Bulletin*. Several public events have been organized, including a series of four public lectures on May 20-23 about the work of the Observatory. In addition to the usual Tuesday morning and Saturday evening tours, there will be a series of special tours for groups such as the RASC and the citizens of Richmond Hill. A major campaign has been organized to raise funds for the modernization and expansion of the Observatory, and for the provision of a larger telescope at the southern station at Las Campanas in Chile. All in all, it will be a very busy but exciting year!

The Editors wish to thank all those who contributed to this Special Issue, and especially Esther McCleary for typing it.

John R. Percy

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RESEARCH PROGRAMS AT THE DAVID DUNLAP OBSERVATORY

This brief survey deals specifically with programs undertaken with the 1.9 m reflector. Other important programs are carried out with the 0.6 and 0.5 m reflectors (including the twin-telescope photometer system described elsewhere in this issue) and with the 0.6 m reflector on Las Campanas. The programs on the 1.9 m telescope tend to exploit the particular advantages of a major "local" observatory: the ability to carry out large-scale and long-term projects with both thoroughness and flexibility.

A variety of spectroscopic binaries have been under study for many years. Some of these are well-behaved, repeatable short-period systems; for these, the "local" observatory offers the ability to obtain complete phase coverage. For less repeatable systems, cycle-to-cycle changes can be monitored (as in the RS CVn stars), and it has been possible, for instance, to look for correlations between spectroscopic behaviour and the 294 day X-ray periodicity in HDE 226868 (Cyg X-1). Long-period binaries can be studied, including those which contain supergiant components - Cepheids, for instance. A few spectroscopic-astrometric binaries under study have periods of a decade or more.

The ability to obtain complete phase coverage of strictly periodic phenomena has been exploited in the study of pulsating variables such as Cepheids, and rotating variables such as the chemically-peculiar (helium-strong, helium-weak and Ap) stars. In the Cepheids, long-term changes in amplitude have been monitored - notably the three-year modulation in the amplitude of HR 7308 and the slow decrease in the amplitude of Polaris. Two large projects on irregular, long-period pulsating stars have recently been completed: one on Mira stars and one on quasi-Cepheids like 89 Herculis. The 1.9 m telescope is also well suited to the study of unpredictable eruptive events such as novae, and irregular, long-term phenomena such as the spectroscopic variability of Be stars. Because of the flexibility in scheduling the 1.9 m telescope, it has been possible to use this instrument in several international multi-technique "campaigns" on specific stars and groups of stars.

The 1.9 m telescope has also been used to carry out pioneering studies of line-profile variability in OB stars, thought to be due to non-radial pulsation. Nowadays, most such studies are carried out with high signal/noise detectors on high-dispersion spectrographs, but important early studies of ϵ Persei, λ Eridani and V986 Ophiuchi were carried out at DDO using classical photographic spectroscopy.

For fifty years, the 1.9 m telescope has been used to accumulate the kind of data (lots of plates of lots of stars) which are necessary to carry out a large-scale project in a thorough way. Recent examples have been the studies of OBN/OBC stars and of the binary frequency among the runaway OB stars.

A variety of smaller projects have been completed or are underway (and are described in the annual reports of the Observatory). In spare moments, the 1.9 m telescope is being used to obtain archival spectrograms of bright stars, which will add to the nearly 50,000 spectrograms which are already in the DDO plate files. These in themselves provide a wealth of raw material for future research projects, above and beyond any new material obtained.

John R. Percy

THE CHANT RETICON

Several years ago, the Observatory purchased, with the aid of funds from the Chant endowment, a Reticon 1024-S diode array along with a microNova computer and other electronics to construct a high precision solid state detector system for spectroscopy with the 1.88 m telescope. The Reticon array consists of 1024 light sensitive silicon diodes, each measuring 0.025 by 2.5 mm. The silicon diodes are intrinsically more light sensitive than photographic plates, especially in the red and infra-red, but the electronic noise produced limits the sensitivity to very faint signals. On the other hand, with brighter sources and long enough exposures, a cleaner and lower noise spectrum can be obtained than can be done photographically (at least, without Herculean efforts). To achieve this, however, the chip must be kept cold, about -130°C . Much noble effort was expended to construct a cooling system which would be more convenient than the conventional liquid nitrogen systems, but unfortunately, all of them raised problems of their own, and, finally, we constructed a liquid nitrogen dewar last year which was commissioned in September.

Our tests have shown the system to be noisier than those based on the Reticon 1872-F chip used on some other systems, but we have now a working system which has begun to produce scientific data. At present, we are changing the host computer system to a more powerful and convenient PDP-11, a task which is simplified by the fact that most control functions are provided by a dedicated 6809 based micro computer which rides on the spectrograph and which has been quite successful. Meanwhile, we will be examining other lines of improvement as we continue with the construction of an 1872 based system for Chile.

Karl Kamper

THE ECHELLE RETICON

Several years ago the DDO shop built a copy of the cassegrain echelle spectrograph designed for the Center for Astrophysics by Don Schroeder and Dave Latham. The original is now used with the MMT and the 1.5 m telescope on Mt. Hopkins, and copies are in operation at several other observatories. The spectrograph is a cross-dispersed echelle design with the dispersion varying from about $1 \text{ \AA}/\text{mm}$ at 3000 \AA to about $3 \text{ \AA}/\text{mm}$ at 1 \mu m . The plans are to use this instrument at Las Campanas to provide a high dispersion capability at our southern observatory, but it will be used initially at DDO to put it in working condition

To support the high resolution capabilities of the echelle spectrograph, a project to build a RETICON detector system for it was also begun. Because the purpose of the echelle + RETICON system is to make high resolution, high S/N observations of relatively bright stars, the 1872 RETICON was selected as the appropriate choice. This chip has pixels which are 15 \mu m wide, the smallest pixel size now available. Selecting this RETICON also enables us to use the electronics designed at UBC and used at the CFHT; this design has the lowest readout noise yet achieved with a RETICON.

An important consideration in the design of a RETICON system is the manner in which the chip is cooled to its operating temperature of about -100°C . For the Chant RETICON project, a cooling system which avoided a bulky liquid nitrogen dewar was considered very desirable. While a bulky dewar is of less concern for the echelle, the ready availability of liquid nitrogen at Las Campanas had to be considered. Because of this, it seemed best to suspend work on the echelle RETICON until the Chant cooling system had been completed. After trying several alternative methods, it became apparent that there is no viable alternative to a liquid nitrogen dewar system at this time. Having reached this decision, the echelle RETICON project has been reactivated because the UBC system also includes an excellent, proven liquid nitrogen dewar.

The echelle RETICON project is now progressing steadily. The UBC circuit boards have been fabricated, and most of the components are in hand. The components will be inserted into the boards in the Erindale College electronics shop to help relieve the pressure on the DDO shop. The UBC dewar is being manufactured in Vancouver by the shop which has built them for UBC and the CFHT. After so many frustrating delays I have learned not to predict a time for the completion of this project, but the rate of progress is very encouraging and we seem to be on a proven path to the goal. I hope I will be able to display an observation taken with the echelle and its RETICON in an upcoming issue of the Doings.

J.B. Lester

SHECTOGRAPH PROGRESS

In 1983 we were granted \$89,000 by NSERC to build a photon counting spectrometer. Adapting the "Z-machine" design of Latham and Geary (CfA) which in turn is based on Shectman's system, we are completing a detector which will count photons in two rows of 4096 pixels each at a resolution of 4 pixels or less. Although intended for the 74-inch telescope and its Cassegrain spectrograph, the system is self-contained and highly portable, being mounted entirely on the telescope and connected to the outside world by two serial data lines.

Engineers Shenton Chew and Wlodek Kunowski are working full-time debugging the electronics. Dave Blyth, Frank Hawker and Karl Kamper are assisting in the design and construction of the intensifier head, while undergraduates Andrew Platzer and Lian Zerafa have provided invaluable help with the electronics and software development.

The compact intensifier head uses two VARO 40 mm electrostatically-focussed tubes coupled to a VARO 25 mm microchannel-plate tube, in turn fibre-optically coupled to a pair of 1024-SF Reticons. The quantum efficiency of the first stage has been tested at 14% at 500 nanometers. The usable spectral range is 380-860 nm. VARO tubes have recently been shown to have better photon-counting efficiencies than any other commercially available tubes. Although their ultraviolet response is poor, their red response is excellent; our tubes have been selected for the best blue response possible with this kind of intensifier.

"First light" is expected at the end of the summer.

Stefan Mochnacki

The PDS Microdensitometer

The PDS microdensitometer, which was installed at the David Dunlap Observatory in August 1974, has become the primary auxiliary instrument in the Department. It is used for scanning all types of photographic plates, and the control computer also functions as a (very!) modest 1-D image processing system. During a typical year, one-third of our faculty and graduate students will make use of the system, and it is very heavily scheduled. It is used more than 3100 hours per year, which is 36% of the total hours or 175% of the business hours available in a year. About 20% of the time is used by visiting investigators. The biggest visiting users are from Université Laval, Université de Montréal, and the Ontario Cancer Institute, but in the last decade, the system has been used by more than two dozen astronomers from more than a dozen institutions in Canada, the United States, and several other foreign countries.

The original PDS 1010A microdensitometer has been upgraded by replacing the drive screws on the platen and adding a second set of objective lenses for improved depth of focus in applications that don't require the higher resolution of the original objectives. The computer control system consists of a PDP 8/E CPU with 32 K word memory, floating point processor, high speed PTR/PTP, 9 track 800 bpi magnetic tape drive, 2.5 Mbyte disk drive, DECwriter IV, HP2647A Intelligent Graphics Terminal, Zeta pen plotter, and a chart recorder. The system can be connected to the campus VAX via 2400 or 4800 baud telephone lines so that small amounts of data (spectra but not 2-D scans) can be quickly transferred to the larger machine.

We have recently purchased a PDP 11/23 computer system to replace the existing control computer. We hope to have this installed by the end of the calendar year. This system will be much faster (and quieter!), have much greater memory and disk storage, and will have a 9 track 1600/6250 bpi tape drive, which will make it much easier to transfer data to other computers. We also have acquired an improved A/D converter for the microdensitometer, which will make it possible to scan at higher speeds than has hitherto been possible.

The software on the system has been developed over the years by Austin Gulliver, Alan Irwin, Alex Hay, Karl Kamper, and especially Ron Lyons. At present, we have routines for controlling the microdensitometer, reducing and manipulating photographic spectra, measuring radial velocities (several algorithms) and equivalent widths, iris photometry of stellar images, and astrometry. Additional 2-D image processing routines are available on the VAX.

The DDO PDS acts as a service facility for both local and guest investigators in the sense that all requests for time on the system are accepted provided they are technically feasible. We can normally accommodate guest investigators within 4-6 weeks of their request for time. Guest investigators may operate the system themselves, or they may leave photographic materials with the microdensitometer operator, Ron Lyons, who will have them scanned according to their specifications. In the later case, we expect the guest investigator to make an initial visit to the Observatory to consult with Ron on the capabilities of the machine and the requirements of the program. There is no charge for use of the machine or for service scanning for guest investigators supported by NSERC or NRC.

Tom Bolton

COMPUTING TRENDS IN ASTRONOMY AT TORONTO

The Physics/Astronomy VAX Consortium at the University of Toronto has received a major grant from NSERC to acquire a DEC VAX 8600 computer, to be installed this summer. CITA is receiving one of the present two VAX 11/780's as its own machine, while the other 780 and 750 will probably be sold. The 8600 is about four times as powerful as a 780, but its mainframe-like architecture will increase the usefulness of our facility by more than that, especially in conjunction with the Astronomical Image Processing System (AIPS) and the array processor. ETHERNET terminal servers will also improve performance.

The use of micros and supermicros by the department is becoming more sophisticated; the relativity group headed by Dyer has replaced its DEC LSI-11/23 with a CADMUS 68010-based UNIX system. The Observatory has acquired the LSI-11 (see Bolton's report). At the personal computer level, we are definitely going in the direction of the IBM PC and 100% compatibles; the versatility of these machines and the range of available software and hardware make them the most useful and practical choice. Large number-crunching jobs run on the PC at one eleventh the CPU speed of the VAX 11/780, although the principal usefulness of the PC is in the areas of word-processing, interactive data analysis using spreadsheets, and communication with bigger computers.

Stefan Mochnacki

THE TWIN PHOTOMETERS: REPORT FROM THE TRENCHES

As many of you will know, last spring we put into operation at the DDO a system of two photometers on two telescopes (the 0.6 m and 0.5 m) which work together under the control of one computer. The idea is that while one telescope is set on the star of interest the other monitors a nearby comparison star, so that their difference in output is largely independent of intervening cloud and haze which is common to both. Thus one can do differential photometry on 'non-photometric' nights, which in this climate means roughly doubling the available nights.

A qualm one always has over any such system is how stable it will be. If either or both of the photometers drift in sensitivity you could be in big trouble. Any drifting can be measured by setting both telescopes on the same star, and this we do at least several times a night. The relative stability of the overall system, measured in this way, has been almost unbelievably good. For example, in the V passband the relative sensitivity averaged -0.012 mag in April, -0.016 mag in June, and -0.013 mag in August. For a while I thought that even the telescope mirrors must all be tarnishing at exactly the same rate, but over months there has been discernible a very slow drift in the ultraviolet and violet passbands.

A few of you who were involved in the early days will recall with a good deal of vividness that the stepper motor driving the filter wheel in the one photometer would all-too-readily pick up the start-integration pulse on some settings and send the filter wheel skittering round just when it shouldn't. Herculean efforts by Frank Hawker have now largely eliminated this, and software improvements allow one to save data already accumulated in a cycle during which a filter does fail.

The weakest link in the system is the telescope drive of the 0.5 m (aka the 19-inch). At times rock steady, it is more usually erratic to a degree that necessitates checking the setting every few minutes. This is almost certainly due to a lack of lubrication in the main bearings of the telescope -- something we shall have to tackle soon, although it means taking the entire (and very heavy) mounting apart. On the other hand, I'm happy to report to old 19-inch hands that the coordinate readout system, long thought to be one of the great random number generators of our times, has finally yielded to reason. It is now possible to model the errors, and a few simple computer algorithms permit one to set the telescope quite satisfactorily (aided, I might add, by a much better wide-angle eyepiece for the finder provided by Karl).

All in all, the system works very well and is in steady use. It was easy to verify Armando's finding that the amplitude of Polaris is down to a few hundredths of a magnitude (done, as it happens, entirely on non-photometric nights). Alex was able to determine the 0.01 mag amplitude, eight day variability of V986 Oph, and even on a ninth magnitude star like UU Her it is easy to get differential magnitudes in eight filters to within thousandths of a magnitude in a few minutes.

The twin photometers are not, of course, a complete panacea. They do well under thick haze or high thin clouds, but if there is significant cloud structure on a scale of 14 m (the separation of the two telescopes) or if the clouds are low, sharp-edged and fast-moving, then the results are poor. Still, as a rough indication I've observed on over thirty nights since mid-June with useful results, and that by no means used every possible night.

Well, now that we've got everything working so well, we are, in the best of traditions, going to tear it all down! This is because we are going to switch the controlling computer from the 0.5 m dome to the 0.6 m dome with much consequent rearranging. For years we have suffered from having no warm, dust-free room in which to run computers and peripherals for these smaller telescopes. Dave Earlam and Archie have now constructed such a room in the west side of the 0.6 m dome (as well as cleaning up and repainting the domes), and by the time you read this the switch over should be complete. This will open phase two of the project with the addition of disk drives and a full-width printer to improve data acquisition.

Most of the shop team have helped to make this project a success, but I should particularly like to thank Dave Blyth for building the photometers, Frank Hawker for developing the electronics, and Dave Earlam for the tedious work on the domes and warm room. As for the rest of you -- why not come and try it all out?

Don Fernie
Reprinted from The Doings
November 5, 1984

Editor's Note: "Armando" = Armando Arellano Ferro
"Alex" = Alex Fullerton
"Archie" = Archie Ridder

LIGHT POLLUTION AND COMMUNITY RELATIONS

The skies above DDO were relatively dark when DDO opened in 1935. The population of Richmond Hill was about 1,200, Toronto had a population of about 700,000, and there were essentially no suburbs. Thus most of the artificial light sources were located some distance from the Observatory, and these had relatively low intensities compared to the ones now in use. Today, Richmond Hill has a population of 40,000, Metropolitan Toronto's population is well over 2,000,000, and the area between Steeles Avenue and the Oak Ridges Moraine, which includes Richmond Hill, has a population of over 200,000. It is likely that the population in the latter area will at least double in the next 15-20 years.

The huge increases in traffic densities and speeds and the greater security problems that have come along with this growth have caused businesses and governments to use increasingly higher levels of outdoor lighting. The increased sky brightness due to this growth first became apparent in the early 1960's, and since then, the sky brightness has increased by about 25% per year, although there are indications that the growth rate has slowed somewhat since 1980. By the early 1970's, the sky had become too bright for broad-band direct photography, and the Hg emission lines from street lights were causing serious problems for spectral classification.

Until the early 1970's, it had been very difficult to try to get any control on lights around the Observatory because there were at least four different governments with jurisdiction over lighting in areas within a mile of DDO. However, the first major impacts of light pollution on DDO coincided with the establishment of regional government in the area. This halved the number of governments with primary responsibility for lighting in the immediate area of DDO and made a damage control program possible.

Since then, we have been working closely with the Town of Richmond Hill and the Ontario Ministry of Transportation and Communications to control lighting within a few miles of the Observatory. We have also had excellent cooperation in this regard from the Regional Municipality of York, but unfortunately, we have had no luck in our efforts to obtain cooperation from the nearby towns of Markham and Vaughan, whose lights also have a major impact on the sky over the Observatory.

Since our sky was already too bright for broad-band photography, our principal goal has been to provide the maximum possible protection for stellar spectroscopy in the blue region of the spectrum. Thus we have supported the installation of high pressure sodium lights that are considered unacceptable around installations where broad-band photometry and imaging of faint objects is being carried out. We have also worked to see that lights are shielded so that no light is spilled above the horizontal plane through the light, and we have requested that commercial lights be placed on timers wherever feasible, so that they will be extinguished after business hours.

We have prepared lighting design specifications which the Town incorporates into all site plan agreements in an effort to control light pollution from new developments. However, the Town staff are still learning how to enforce these, and it is often necessary for me to get involved in the lighting design or to intervene to get a problem corrected after construction is completed. The former works pretty well, since I now have a decade of "design experience" to draw on. It is not uncommon for a Developer to request my assistance in the lighting design, and on occasion, the Town has required Observatory approval of the lighting design before the site plan

could be forwarded to the Province for approval. This can be time consuming, but I prefer this to intervening after the fact, which can be very messy, even when we have the full support of the Town. We have still not worked out a satisfactory method for coping with problems from new lights in commercial and industrial developments that were built before lighting standards were incorporated into the site plan agreements.

We also spend a lot of time lobbying the Town Council about the planned uses of the large tracts of vacant land that are still found near DDO. Most of the decisions about land use near DDO will be based on economic and planning considerations which do not put any weight on our requirements, but we hope to have enough influence to prevent the installation of high intensity lighting near the Observatory. Our primary goals are to keep lighted outdoor athletic facilities and commercial and industrial developments with outdoor storage as far from the Observatory as possible. The Town has been very sympathetic to our requests in this area.

These efforts can do no more than minimize the damage caused by light pollution. The sky will undoubtedly continue to grow brighter, but there is some hope that the rate will decline. This may have begun in 1980. The present sky brightness in about $V=17$ mag./arcsec², which is not a serious limitation for the spectroscopic programs now underway or contemplated by our staff. It is a problem for photoelectric photometry of fainter stars, but so far this has not proved to be a serious limitation. This picture is not likely to change much for the next twenty years, and the situation after that will depend on future planning decisions by the province and the development of lighting technology.

Tom Bolton

THE COOKE REFRACTOR: ON THE GO AGAIN

March 27, 1984 marked yet another move for that most venerable of telescopes, the six-inch Cooke refractor. A team from the National Museum of Science and Technology dismantled and crated the century-old instrument for removal to Ottawa and its eventual re-erection at the Museum there.

A full description of the telescope and its history has been given by Brian Beattie in the Journal of the RASC (vol. 76, page 109, 1982), but in brief the instrument was built by Cooke & Sons in England in 1882 and brought to Toronto for the transit of Venus in that year. It spent the next twenty-seven years in the old Magnetic Observatory that stood near Convocation Hall, and then in 1909, after the Observatory was demolished, moved to the Meteorological Service's new building (now the University's Office of Admissions) on Bloor Street.

Generations of university students used it there, and when in 1930 the Met Service decided it had no need for the telescope, the University acquired it and moved it into the Observatory just east of University College. There it served as the Department's main campus instrument until 1952, when the University assigned the campus observatory to other purposes, and the telescope moved to the DDO.

Here too it served many an undergraduate class, but once the new McLennan Labs with the 16-inch and 8-inch opened on campus in 1966 there was little incentive to use the old 6-inch. Neither was it suited to crowds on visitors' nights since access to it was via narrow stairways. Thus the venerable old telescope, although still a fine instrument and in good working order, fell into disuse and desecration by intruding pigeons.

It seemed that a more fitting home for the telescope would be the National Museum of Science and Technology, where it could be displayed to and perhaps even used by the public. Mary Grey, in charge of astronomical matters at the Museum, was enthusiastic about the move, the University officially agreeable, and so after a hundred-and-two years in Toronto the old telescope has undergone perhaps its final remove. Not, one hopes, to the equivalent of a glass case, but to a renewed life of usefulness in bringing pleasure to new generations. Long may it continue.

Don Fernie
Reprinted from The Doings
May 22, 1984.

THE UNIVERSITY OF TORONTO SOUTHERN OBSERVATORY

Since 1971, the University of Toronto has operated a well-equipped 60-cm telescope in the Andes mountains of South America, where the skies are as perfect for astronomical research as anywhere on Earth. The facility is equally available to astronomers across Canada and around the world on a scientific-merit basis. It is the ONLY Canadian facility for observing the southern skies. It and the 3.6 meter CFHT, are the ONLY Canadian telescopes at outstanding sites, where the skies are clear and dark, and the atmospheric turbulence is minimum.

It is hardly surprising that it is Canada's most productive telescope, according to a recent literature survey carried out independently by the director of the Dominion Astrophysical Observatory in Victoria (1984, JRASC, 78, 97). An earlier study by us in 1980 showed that it is also 40% more productive than similar facilities at Kitt Peak, the U.S. National Observatory. While these surveys listed only papers, many of our papers contained thousands of observations, as opposed to one or two per paper for larger telescopes. However one may criticize and justify the statistics, the Chile facility will remain at or near the top. Clearly, on a data-per-dollar basis, it is one of the most productive telescopes in the world.

The unique characteristic of this facility is that we have high-quality equipment available in large blocks of time. The tendency in astronomy is to provide good equipment only for large telescopes on which time is available only in small units, usually less than a week. There are many valuable programs that can be carried out with a small telescope equipped with high-quality instrumentation.

R.F. Garrison
Associate Director
Chile Operations

THE LIBRARY: WHAT'S HAPPENED TO IT

The "DDO" library is one of the best (if not the best) astronomy libraries in Canada, and one of the 10 best in North America. Started by Dr. Chant for the RASC, it was loaned to the Observatory in 1935 and actually purchased from the Society by the University of Toronto in 1961. Volumes have since been added to the collection by use of a combination of University and endowment funds and exchanges.

Over the past 50 years, astronomy has changed. There are more theoreticians and radio astronomers now, whereas they were all but nonexistent during the first 25 years of operation. In addition, the introduction of astronomy at the suburban campuses in the 1960's meant two more centres of operation besides the St. George campus. The department has grown considerably, so while there are now many more people at the observatory than in the first 25 years, there are even more at centres other than the observatory.

In 1983, the main library of the observatory was moved to the downtown campus. It was a very difficult decision and there were many strong feelings on both sides. However, it was finally agreed that the library would be more easily accessible to more of the department if it were located on campus. There is still a library at DDO, made up of volumes which had been on campus and of new books, which were purchased to try to fill in some serious deficiencies in what had been the campus collection. It is intended to be a working library rather than a complete one.

The pressure to move the library downtown was resisted mainly because of the vulnerability of the library to misuse by undergraduates and to centralization by the main library. These are still dangers and will always be problems, but at the moment the situation seems to be fairly well in hand. Though we have been able to handle most of the problems that have arisen from the transfer, the adjustment is obviously an ongoing process.

R.F. Garrison
Library Liaison

THEN AND NOW

Several years before I began working at the Observatory, I used to drive past on Yonge Street with eyes cast Eastward toward the Observatory wondering what it would be like working in such a magnificent place.

When Dr. Heard the Director surprised me by hiring me, I still could not believe my good fortune in having an office ALL TO MYSELF. I even had a telephone that could only be used for local calls, i.e. Richmond Hill area, and was allowed the privilege of calling the campus office once every afternoon at a pre-set time for any important messages. (All Toronto calls were long distance in 1962).

I was not entirely by myself in the office; Mrs. Jean Lehmann worked part-time as our Librarian and for the next ten years we worked very happily together. Little did I dream at that time that I would one day be based primarily on campus. But, I am forever being told that I must keep up with the times and change is good for the soul.

I have also witnessed the Observatory in its more affluent days when we had three full-time secretaries and one full-time librarian. This quota has since been reduced to one full-time secretary (Esther McCleary), a part-time administrative assistant (me) and a librarian (Marlene Cummins) who comes one day a week. The librarian and I spend the rest of our time on campus. You might say that the Observatory has had its UPS and DOWNS.

However, advancing technology, (the computer) has finally driven me from my original office to a larger one next door (formerly Dr. Heard's Office). I must admit, though, that computers are a great boon to the office. This coming year, I will be converting all the accounting from paper to computer data bases. This will greatly aid in balancing next year's ledgers. However, I can always count on 215 Huron Street (Comptroller's Office) to upset these plans in their usual fashion.

I still feel the thrill of driving up Donald Drive and seeing the wide expanse of velvety green carpet surrounding the majestic administrative building and the sparkling WHITE of the 74-inch-dome framed by a background of deep-blue sky and fluffy white clouds.

Joan Tryggve
Administrative Assistant

SATURDAY NIGHT FERVOUR

A warm, pleasant breeze wafts gently through the trees on a hazy, humid summer evening. A full parking lot and the conspicuous presence of a hundred people milling through the marble corridors distinguishes this night from the previous six. In the administration building the "Chief" describes the facilities and guides the audience on a whirlwind slide journey through the cosmos. Meanwhile, two "Indians" scramble about the 74-inch dome, checking the humidity and hoping that the sky will darken more quickly so that M13 will actually be visible! The tour arrives in the dome. The sky is dark enough, and, after the dome Indians patiently explain "how far the telescope can see", the queue forms at the eyepiece. In the darkened dome the Chief puts on a dazzling display of astronomical virtuosity which would leave the most conscientious Ph.D. committee dizzy, and occasionally perplexed. Outside the dome, faithful RASC observers have positioned their instruments beside Kepler's ellipse. They are busily flipping from one celestial showpiece to another, eager to please their audience and delighting in tales of polishing strokes and Erfle oculars. Just one of the hundreds of public nights at DDO, "Saturday evenings from April to October", in 1935, or 1960, or 1985.

Admittedly a few things have changed over the past fifty years. The number of graduate student "Chiefs and Indians" swelled with the coming of the Space Age. Their curiosity piqued, the public came armed with increasing numbers of questions about satellites, the moon, and (of course!) UFO's. The wisdom of placing a large telescope so close to Toronto is queried far more frequently nowadays than in 1935. The slides inflicted on our visitors have improved dramatically, and a few years ago "Betsy" and her Boudoir were handsomely repainted.

Nevertheless, some things simply don't alter with hair styles and fashions. Despite her age, the sheer size of the 74-inch telescope still evokes exclamations from first time visitors, just as she did when she was second only to Mount Wilson's "Hooker". Disappointment on cloudy evenings is universal. But foremost among the constants is the public's thirst and enthusiasm for astronomical information. Chiefs and Indians are constantly bombarded with questions, comments, pet theories, and "how do you know?". Something about astronomy appeals to everyone, and Saturday evenings become unexpectedly rewarding when you hear a youngster at a eyepiece whisper "it's sooo beautiful!".

Something like a quarter of a million people have visited DDO since 1935. This year alone more than 4000 will be informed and entertained. The most meaningful testimony to our program is the enthusiasm it generates: tours are invariably fully booked four to six weeks in advance! But the relationship between the Observatory and the community is genuinely symbiotic, for through our educational endeavours we gain a unique opportunity to tap the interest and support of the public we rely upon so heavily. Our continuing efforts in this direction would no doubt please our generous benefactors, and may in some small way begin to discharge our debt to them.

Alex Fullerton
("Superchief")

TUESDAY MORNING ASTRONOMY ANYONE?

All year round at the David Dunlap Observatory, interested visitors and school groups can be introduced to astronomy and how it is accomplished at a major Canadian research facility. At ten o'clock on Tuesday mornings, the usually sedate atmosphere of the administration building will suddenly be punctuated by the sounds of second graders, excited by their first visit to an observatory, or boisterous teenagers, happy to be out of school for the morning. The occasional individual may also wander in "off the street", sheepishly admitting that it's his first visit despite living in Richmond Hill all his life.

For half an hour, the audience is treated to a slide presentation on topics appropriate to their astronomical background and age; for example, the sun, moon and earth for lower elementary grades, planets for upper elementary groups and stars and galaxies for senior students. Questions are encouraged and occasionally, the students become directly involved by being, say, the "sun" in a phases of the moon demonstration or by pointing out a constellation of a slide of a star field. From time to time, lectures have been interrupted by the startled cry of an eager student who has leaned too far forward in the infamous DDO lecture room chairs and landed unceremoniously au derrière. Evidently, the original observatory decorators thought astronomy too serious a study to encourage the restless types and a little chair sabotage was in order. Fortunately, however, the possibility of a senior taking a bad tumble prompted the observatory to replace the people-hating chairs with more stable versions this year - something which did not go unnoticed. As one second-time visitor remarked immediately after the acquisition, "Oh, you got new chairs!"

The slide presentation is followed by a visit to the 74" dome where, according to some of our visitors, Canada's largest ray gun is housed. A description of the optics of this telescope is inevitably met with, "Can we look through it?". It's easier to respond to this question when it's cloudy! Nevertheless, the dome is opened (weather permitting) and the telescope and dome are moved around, showing how each part of the sky could be viewed during regular night observing. The tour concludes with a question and answer period and/or perusal of the display of astronomical photographs in the administration building.

Over 1200 people attended the Tuesday morning tours from May/84 to April/85, of which 85% were school groups and the rest church or seniors groups and individuals. In 1985, DDO's 50th anniversary and the year of Halley's Comet, we welcome your interest in the observatory and encourage you to book a tour for yourself or your favourite group or class -- but please, don't ask to look at the stars!

Judith Irwin

THE RETURN OF 'ELMS LEA'

I suppose for about as long as it has belonged to the University the Director's residence has been known as Observatory House. I'm not sure who chose this, but I suppose it was done in imitation of such historical precedents as are to be found at places like Greenwich. Certainly it is not unique. Nor does it seem to be official. All blueprints and documents in the hands of Physical Plant refer to it by the quaint term "The Astronomer's Residence", which (emphasizing the first word) may be pleasing to the incumbent but has little else to recommend it.

Anyway, when the family who originally owned the house took renewed interest in it a few years ago, they expressed a certain polite regret at the passing of the original name: Elms Lea. On reflection Yvonne and I came to like this name, finding in it a pleasing lilt and uniqueness lacking from Observatory House. So when it came time last summer to have the driveway sign repainted we opted for Elms Lea, and now that elms are making a comeback we intended exploring the possibility of replanting some around the house. The impact of this name change on Physical Plant will, like so much else, probably be nil, but at least it restores a little history.

Don Fernie
Reprinted from The Doings
November 5, 1984.

FUND RAISING: A GOLDEN OPPORTUNITY

Public institutions often mount important fund-raising campaigns to coincide with milestone anniversaries in their history. The Fiftieth Anniversary Year of the David Dunlap Observatory, beginning 31 May, 1985, is such a milestone for our department, and it is the only one that will occur during the professional careers of most of our staff. This is our opportunity to mount a campaign which will enable the department to solve problems which can not otherwise be solved and to take initiatives which will be of widespread benefit.

The Department of Astronomy and the David Dunlap Observatory have proposed to the University of Toronto a fund-raising campaign to provide five million dollars for an expansion of the research space in Richmond Hill and a medium-sized telescope in the southern hemisphere. The University has approved our proposal and we have begun the hunt for prospective donors.

Earlier, a detailed proposal was submitted to the Department of Astronomy. The recommendations were reached after considerable internal debate. The committee issued calls for written submissions, circulated an interim report to the entire department (including students and support staff), which was vigorously discussed at several staff meetings, and then circulated a brief summary of the results in order to stimulate discussion at a Town Meeting. Numerous formal and informal meetings were held to discuss the written and oral responses that were received. Thus, the recommendations represent a consensus in the department. The projects selected are relevant to the fiftieth anniversary of the David Dunlap Observatory and provide the greatest benefit to the department, to the University of Toronto, and to the world of astronomical research.

In our opinion, the most serious problem confronting the department is the lack of research space appropriate to the use of modern technology, so we have given this our highest priority. We cannot undertake several other, apparently more glamorous, projects until we acquire more research space. The only practical place to locate additional high-technology research space is at the David Dunlap Observatory in Richmond Hill.

Since 1971, we have made excellent use of our small (61 cm) telescope at Las Campanas in the foothills of the Chilean Andes. It was intended to be a primer for a larger telescope, but hard times have prevented us from proceeding. The opportunity provided by the fiftieth anniversary of DDO may be our only chance to expand this very productive operation to a larger telescope. A 2-meter-class telescope is the logical continuation of our operation and it would give us telescopes of comparable size in both hemispheres with which to pursue our research. As with our smaller telescope, the new one would be available to astronomers solely on the basis of scientific merit of proposal, irrespective of national or institutional origin.

We have quotations from telescope and dome manufacturers, as well as from the university's physical plant department. The telescope will cost approximately two million Canadian dollars (1985), the dome and building will be about one million and the expansion of the David Dunlap Observatory research space will be close to two million, for a total of five million Canadian dollars, in round figures.

The most obvious benefit to donors is the association of their name with exciting, high profile science. For example, the David Dunlap Observatory is a familiar name to ordinary people in Ontario and across Canada, as well as to astronomers around the world.

Most astronomical research facilities have benefited from private donations, and the names of the donors have lived on through the research opportunities that have been provided. Astronomical observatories have a much longer life expectancy than other scientific facilities; there are several still in use one hundred years after they were built.

Astronomical research is reported in the newspapers more than any other kind of scientific research, especially when the small number of astronomers in the world is considered. Medical research, for example, gets a bit more press, but there are hundreds of thousands of medical researchers in the world as compared with a few thousands of astronomers.

There are numerous long-term benefits of a more practical nature. Most people don't realize, for example, that helium was first discovered in the Sun, or that atomic power was proposed by astronomers as a solution to the problem of the lifetimes of the stars.

Astronomers push technology to its limits and contribute significantly to advances in computers, electronics, optics, mechanical engineering, cryogenics, and photography, to mention just a few areas of influence. As an illustration of this point, we find that our Ph.D. students are in great demand by the aerospace and computer industries, as well as by government departments involved with space research and remote sensing. Also, our proposed new telescope will use new optical, mechanical and computer technology in its construction and will provide us with much more telescope per dollar than would be possible with the older technologies. There are a few Toronto companies that have been involved with building foreign observatories and it may be possible to interest them in developing the relevant new expertise, which can then be applied to other projects. We have already had a few inquiries as a result of an unsolicited article in the Star some months ago.

Provision of facilities of this nature will ensure that we retain our reputation as one of the world's leading departments of astronomy.

R.F. Garrison
Chairman, Fund-raising Committee

CONGRATULATIONS

We apologize to Brian Glendenning for omitting his name from last issue's list of students who completed their M.Sc. program in January, and to Jack Winzer for spelling his name incorrectly.

Tom Bolton has been elected a Fellow of the Royal Society of Canada.

Charles Dyer has been appointed Associate Professor with Tenure in the Departments of Astronomy and of Computer Science, Division of Physical Sciences, Scarborough College.

Helen Hogg received the 1985 Sandford Fleming Medal of the Royal Canadian Institute on April 27, for her contributions to public appreciation of science.

Phil Kronberg has been awarded Guggenheim Research Fellowships for 1985-86. Phil will be based in Toronto during the period of his Fellowship.

John Percy has been elected President of the Royal Canadian Institute for 1985-86.

WELCOME AND FAREWELL

Laura Fenton-Lloyd has left the department, having worked for Phil Kronberg for just over one year. Her husband Richard has changed jobs, with the consequence that Laura has moved to Listowell, Ont. We wish Laura and Richard all the best in their new, more rural lifestyle!

Laura Carriere, who is just completing a Physics and Astronomy Specialist programme at the U. of T. will begin working as a research assistant for Phil Kronberg in late May.

Rich Mably has, since the beginning of March begun working in a part time capacity for Phil Kronberg. Rich is a physicist who has previously worked for the Northern Alberta Institute of Technology, and more recently in the Department of Physics.

Louis Noreau has left the Department to take up a postdoctoral position at the Université Laval in his native Quebec City.

Stop Press: We congratulate Louis for having successfully defended his Ph.D. thesis on May 6, 1985.

COMINGS AND GOINGS

Tom Bolton attended a meeting of the CFHT Canadian Applications Meeting in Ottawa on March 7 to choose referees for the CFHT proposals for second semester 1985.

Tom Bolton was the colloquium speaker at the University of Western Ontario Department of Astronomy on April 11. His topic was The Photospheres and Magnetospheres of the Helium Spectrum Variables.

Tom Bolton attended the CFHT SAC/TAC meetings May 6-8 in Paris and stayed on for a few days of sight-seeing afterwards.

Tom Bolton, Alex Fullerton, John Percy and Chris Stagg travelled to Boulder, CO August 17-19 to attend the Workshop on the Connection Between Non-Radial Pulsations and Stellar Winds in Massive Stars. Former student Doug Gies was also in attendance.

Brian Glendenning began the series of VLA observations for his Ph.D. thesis project on April 27th.

Phil Kronberg gave an invited colloquium on February 14th to the combined sections of the Herzberg Institute of Astrophysics entitled "First Look at the Anatomy of a Starburst". He spent Friday, the 26th April chairing the NRC ARO Steering Committee in Ottawa.

Phil Kronberg has been at the VLA 3 times this winter (in late January, early March, and most recently on 20-23 April) supervising various VLA observing and data reduction programs with Ed Zukowski, Laura Fenton-Lloyd and Brian Glendenning. During April, Phil Kronberg spent a couple of days in Minneapolis in connection with the U. of T. Administrations' Supercomputer Planning Group, of which Phil is a member.

John Percy gave lectures on March 26-29 at Illinois State University, the Lakeview Museum of Peoria, Bradley University, and Illinois Central College, under the auspices of the AAS Harlow Shapley Visiting Lecturers Program. He then went on to Iowa State University where he gave a seminar on "Hot Variable Stars", and worked with Lee Anne Willson on their collaborative book on variable stars.

Ernie Seaquist's travels in late April and early May have taken him to NRAO in Tucson, VLA and Socorro in New Mexico, Ottawa, DRAO in Penticton, and Vancouver.

Doug Welch is spending most of May in Saudi Arabia, where he is acting as a Consultant to DSMA, an advanced-technology consulting company. More about this in the next issue of the Doings.

Bob McLaren visited the department on May 3 on his way to the CFHT SAC meetings in Paris.

Edwin Zukowski has had several VLA observing runs at the VLA this winter, and will return for yet another round of observations in June.

MISCELLANY

Tom Bolton has been appointed to the committee to choose the second generation instruments for the Hubble Space Telescope.

Bob Garrison addressed the Senior Alumni "Canadian Perspectives" Lecture Series on "The DDO: Outstanding Achievements over the Last Fifty Years" on April 15.

Petrusia Kowalsky has taken a position as a Research Officer, working with John Percy. Initially, she will be working on a project, funded by the J.P. Bickell Foundation, to measure, analyze and interpret the long-term period changes in Mira variables.

Barry Madore has written to say that he and Wendy Freedman will be in Toronto in June, at which time they plan to be married.

Stefan Mochnecki has been invited to be a member of the Scientific Advisory Council of the Mount Wilson Research Corporation, a fledgling non-profit organization set up to take over the management of Mount Wilson Observatory, which is being abandoned by the Carnegie Institution of Washington.

The Canadian Applications Committee for CFHT (Bolton, Hardy, Harris, Kormendy, and Kwok) met at DA on May 1 and 2 to evaluate the Canadian applications prior to the SAC/TAC meeting.

SUMMER STUDENTS

The following students will be working in the department this summer: Stephen Allen (with Dyer), Man Hoi Lee (with Rogers), David Leggett (with Kamper), Shiu-Hong Lui (with Seaquist), Peter Mathieu (with Yen) and Michael Richer (with Percy). Bruce Coffin will be working with Lester at Erindale. All these students are U. of T. students with the exception of Stephen Allen, who is from the U. of Waterloo.

Expanding Your Horizons Conference - May 2, 1985

On May 2nd, Mercedes Richards led Astronomy activity-and career-workshops for the Expanding Your Horizons Conference, sponsored by the North York Board of Education, held at A.I.S.P. - Glen Avon Centre. This one-day conference was designed (i) to increase young women's interests in Mathematics, (ii) to foster awareness of career opportunities for women in Mathematics and Science-related fields, (iii) to provide students an opportunity to meet and form personal contacts with women working in traditional male occupations.

Over 250 girls from several schools in North York participated, and workshops were led by a large support group of women who are currently involved in Math and the Sciences. The conference was a great success.

Mercedes led activity workshops at a similar conference sponsored by the Toronto Board of Education last November, and, along with Christine Clement, Christine Wilson, and Judith Irwin, has been involved in 'networking' activities as a mentor for high school girls who occasionally come to the University of Toronto to observe women scientists at work. Mercedes is a member of the Canadian Association for Women in Science (CAWIS)

CITA NEWS

Professor J. Richard Bond of Stanford has accepted an appointment as Associate Professor with tenure in CITA, starting July 1, 1985. His interests include nuclear astrophysics, population III stars, particle physics and the early universe, galaxy formation, the cosmic microwave background and cosmology.

Serge Pineault, Université Laval, has begun a four-year term as a member of CITA Council.

CITA welcomes Margaret Fukunaga as its new Administrative Assistant.