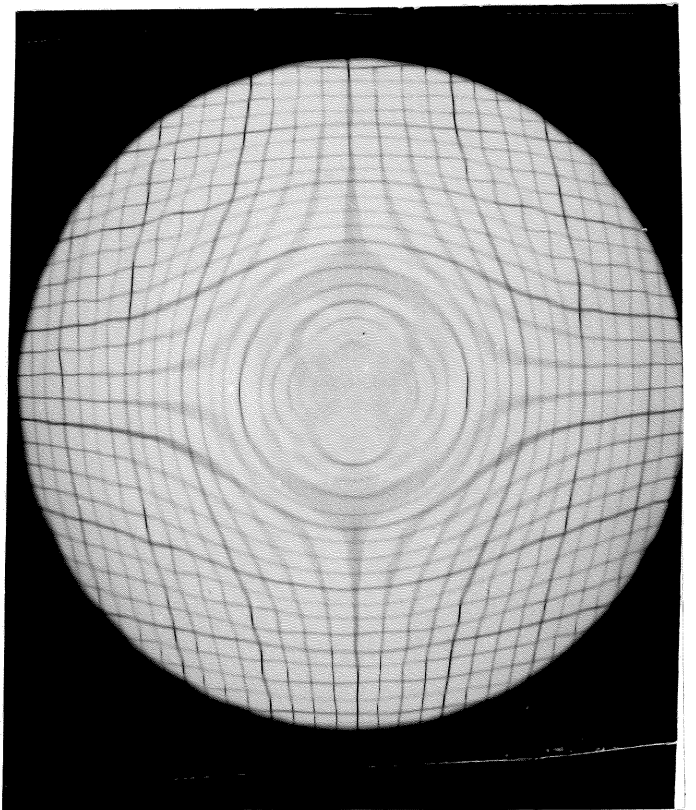
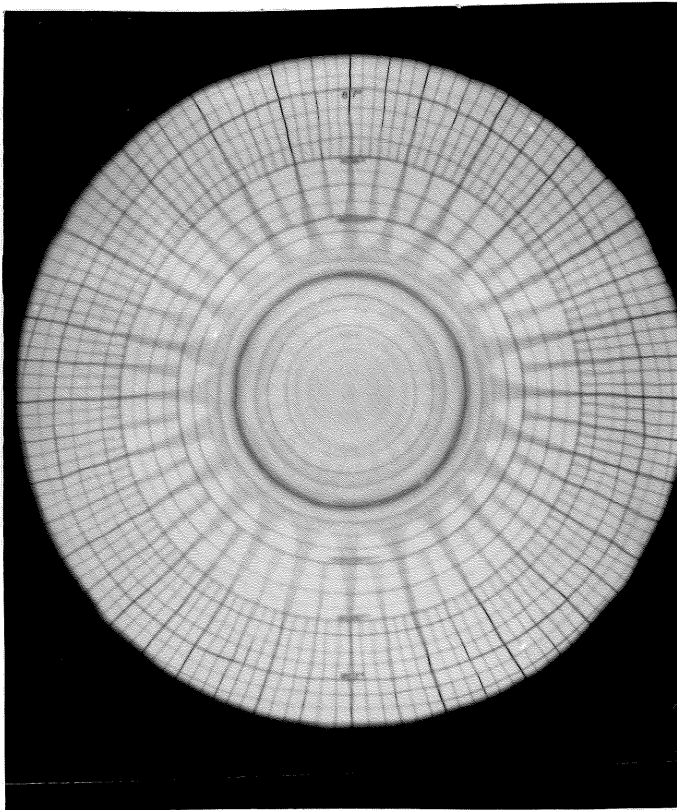


THE ^{DAVID} DUNLAP DOINGS

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March 6, 1981



EFFECTS OF A GRAVITATIONAL LENS

See p.2

The cover photographs demonstrate visually the distorting effects of a gravitational lens. They were made by photographing the backlit polar and equatorial overlays for the Palomar Sky Survey through a gravitational lens simulator designed by Charles Dyer and Robert Roeder and constructed at Scarborough College. The simulator is a Plexiglass disc, 12 inches in diameter, one face of which has been figured to reproduce the bending of light by an E0 galaxy with a King density distribution. On a scale of 1/3 inch per kiloparsec, the mass of the galaxy would be $1.3 \times 10^{15} M_{\odot}$, and the core radius 8.5 kpc. The large mass was a necessity in order to get demonstrable effects.

On the photograph of the polar grid, the circle of inversion can be easily seen. The fact that a gravitational "lens" has no clearly defined focal length is also evident, as it was impossible to keep the whole image in focus. On the equatorial grid, multiple imaging of some of the lines, together with the radial deflection, is responsible for creating the scallop patterns inside the circle of inversion. The slight wiggles in some of the lines, noticeable at about 2/3 of the radius, show that despite the best efforts of the machine shop, some deviations from the exact figure remain.

CONGRATULATIONS

To *John Lester*, who has been recommended for promotion to Associate Professor with tenure, effective July 1. John joined the Department in July 1976.

To *Camie and Peter Martin* on the birth of their first child *Nicholas Alexander Martin* on Tuesday, January 27.

To *Ingrid and Archie Ridder* on the birth of their third daughter, *Yvonne Marie* (a sister for Christine and Melanie) on Tuesday, February 24.

To *Esther Salve and Josef Hindel*, who will be married on April 5 in Toronto and then honeymoon in Florida. Esther was Department secretary from November 1972 until August 1976, and now has a position as a researcher for the program *Sunday Morning* on CBC Radio.

COMINGS AND GOINGS

Lynda Colbeck is the new DDO and departmental librarian. Lynda graduated from the Master of Library Science program at U. of T. in 1977 and then spent one year with the Ontario Educational Communications Authority. For the past three years, she has been with the Media Centre at U. of T.

Canadian VLBA Design Study Underway

NSERC has recently announced that it will provide funding for the phase II design study of the Canadian Very Long Baseline Array. The decision follows the establishment of a high priority rating for this proposal by the National Research Council of Canada. Some portion of the funding may be provided by N.R.C. The design study will cost approximately \$300,000.

The study, to begin immediately, will be carried out by Canadian astronomers in consultation with Canadian industry. It will be supervised and the funds administered by the VLBA Planning Committee chaired by Ernie Seaquist. The aim of the phase II study, which will take about a year, is to provide a final design for the array and to determine the cost of construction and operation.

PRIORITIES IN ASTRONOMY BEING STUDIED ANEW

The Associate Committee on Astronomy (ACA) of the NRC is preparing a new statement of priorities in Astronomy in Canada. Subcommittees, several in close association with CASCA, have been set up in nine fields. Readers of the Doings are reminded that they are invited to submit recommendations and comments to the Chairmen listed below. The results of this exercise will undoubtedly have a major impact on the future of Canadian astronomy.

The subcommittees are Radio Astronomy (Norm Broten), CFHT (Bob Garrison), Space (Gary Welch), Infrared Astronomy (Bob McLaren), Theoretical Astronomy (Dick Henrikson), Optical Astronomy (Colin Scarfe), Teaching (John Percy), Employment (Carman Costain), and National Facilities (Tom Bolton).

The subcommittee chairmen must report at the next ACA meeting in late May.

LAS CAMPANAS NEWS

Rick Crowe reports

Just recently I completed a 6-week sojourn in Chile. It was my second in less than a year - the previous trip was during August and September of 1980. On each occasion, four of the six weeks were spent on Las Campanas doing direct and image tube spectroscopy of Mira variables with the Toronto 0.61-m telescope. The purpose of this project is to examine in detail in a large number of Miras (about 40, observed over at least one period) the so-called line-weakening phenomenon, which is particularly characteristic of the neutral metallic lines on the damping portion of the curve of growth during cycles of faint maxima.

During my August run, seven nights out of 28 were lost to cloud, snow and Magellan's misery (sometimes referred to as Allende's revenge). Afterwards, Peter Wizinowich and I took a 72-hour (each way) bus ride from Santiago to Rio de Janeiro via Buenos Aires and the Iguazú Falls - a once-in-a-lifetime experience, since nobody would be crazy enough to do that twice!

The weather this last time was slightly better than in August - all 23 nights were photometric! It should be noted that these were not consecutive; there was a two-week hiatus in between the two halves of the run, during which time I enjoyed a holiday in the beautiful lake districts of Chile and Argentina. Apparently, though, the interim nights were all photometric as well!

A total of 37 program plates were obtained (counting both runs) - 25 of these were taken with the image tube. Since each plate contains 6 to 7 spectra, on the average, there is a large amount of classification to be done. More significantly, it should be possible to scan the spectra on the PDS, because we now have the facility in Chile to spot calibrate the image tube plates.

All in all, this latest trip was my most successful observing run ever! Even the DC-10 ride from Lima to Santiago was spectacularly clear, permitting a superb aerial view of the lines of Nazca in Peru! Astronomy may be the "space between the blowouts", to quote a graduate student from Waterloo, but on Las Campanas during the summer months, astronomy fills all of the available space-time!

Barry Madore reports

Barry and Mario Pedreros had a successful seven-night run on the Las Campanas 2.5 m Dupont reflector, in February. They were using the image-intensified reticon spectrograph, better known as the "Schectograph", to obtain radial velocities for companions to southern Shapley-Ames galaxies. Only about an hour at the beginning of one night was lost due to abnormally high humidity. When Bob Garrison arrived to take over on the 0.61 meter, Las Campanas was once again populated predominantly by Canadian observers, not a totally unknown phenomenon at southern observatories.

STRESS AND STRAIN ON THE PDS

The demand for PDS microdensitometer time has been increasing steadily, primarily because of increased exploitation of the 2-D scanning capability of the machine. If the current trend continues, the machine will be saturated for long periods of time within a few months. This is a highly undesirable situation because it will cause delays in some projects and seriously limit our flexibility. We are planning to take several steps to get around the problem before it becomes serious.

Since the PDP 8/E computer is required to control the microdensitometer whereas any computer can, in principle, be used for data processing, it has always been our policy that applications requiring the computer to control scanning would have priority over pure data processing applications. We have never had to invoke this policy, so no effort has gone into providing data processing capability on other machines. This will now change.

We plan to transfer data processing programs that require no interactive graphics capability to the VAX as rapidly as possible. This will affect the iris photometry and radial velocity programs first. Once these are running on the VAX, we will expect most of the users of this software to give up data processing on the PDP 8/E.

It will take longer to transfer the spectrophotometry program (REDUCT) because it requires interactive graphics. We are looking into two alternatives, both of which will be implemented if practical. First, we can try to arrange for a modem and phone line so that the HP 2647 can be connected to the VAX. Second, we can try to add a tape drive to the MicroNova computer at the 74-inch when it is installed so that it can be used for PDS data reduction on cloudy nights and during the day. It will not be possible to use REDUCT at DA without extensive modifications or without an interactive graphics terminal. Neither are in the works at this time.

In the meantime, as a PDS user or potential user you should not assume that you will automatically get as much time as you want on the machine when you want it. You should consult with me if you are planning a major new PDS project or a major increase in your use of the machine.

Bln

SCARBOROUGH'S NEW SPECTROGRAPH

On 26 Feb. Peter Martin, Chris Rogers and Raymond Rusk obtained the first spectrograms with the new classification spectrograph on the 12-inch Questar telescope at Scarborough College. (The spectrograph was built following Bob Garrison's design in the Scarborough College workshops.) Spectra were recorded at 120 A/mm, widened to 0.8 mm, on IIA-0 plates. Only bright (!) stars were observed: series of exposures of Sirius, Betelgeuse and Castor were obtained. The best exposure times for these stars were roughly 5, 60, and 60 seconds respectively, so all the accessible stars in the Observer's Handbook, and fainter ones too, should be easily reached in 15 minutes. The spectrograph will be used by students in AST A02Y and AST B02H, the new-this-year half course in practical astronomy.

THREE GRADUATE STUDENTS GET TOP AWARDS

Pamela reports that three Astronomy graduate students have been awarded Connaught Scholarships, the prestigious "Opens" worth \$6,200 plus academic fees. The recipients are Neb Duric, Leif Schioler, (these are renewals) and Tom Box.

UNDERGRADUATE AWARDS

Better late than never, we report some of the winners in 1980.

At Erindale the John A. Pounder Prizes in Astronomy were awarded to Elias Borges, Peter Jekel, and Bradley Todd Mavins.

On the St. George Campus the John Pounder Awards in Astronomy in II-year went to Michael Gaspar and Wendy Brandts. Tom Box was awarded the III-year John Pounder Scholarship in Astronomy and Astrophysics as well as the H.S. Robertson Scholarship in Astronomy.

At Scarborough the Pounder Prize in Astronomy was awarded to John F. Harper.

Our congratulations to all these outstanding students.

No one qualified for the RASC Gold Medal in 1980.

POTPOURRI

Tom Bolton gave a talk on "The Search for Black Holes" at the University of Guelph on February 3. He will be giving a similar talk as a CAP Lecture at Dalhousie University in Halifax on March 6 and at Queen's/RMC on March 11. On February 25, he lectured the Toronto section of the Illumination Engineering Society on the subject of "Light Pollution". In Tom's words, this was like "Custer lecturing the Sioux on bow and arrow control".

Ernie Seaquist is also a CAP Lecturer this year, his topic being "High Energy Processes in Stars and Galaxies". He was at the University of Alberta in Edmonton on January 30 and at the University of Western Ontario on February 18. Also during the past month, Ernie has given talks on "The Circumstellar Environment of SS 433" at U.B.C., D.A.O., and U.W.O.

Our item in the last issue concerning the AAS meeting in Albuquerque was incomplete in not mentioning that *Nancy Evans* was the third attendee from Toronto (in addition to Seaquist and Kamper). Nancy presented two papers, "Preliminary Orbit and Mass Estimate for the 3^d8 Classical Cepheid SU Cygni" and with *Dave Turner*, "A Detailed Investigation of the R Association Containing the 1^d95 Cepheid SU Cassiopeiae".

Chris McAlary attended the Workshop on Active Galaxies held at Kitt Peak National Observatory January 19-23. The topics covered a wide range, from radio jets to the X-ray properties of BL Lac objects. Observations from both the VLA and Einstein provided stunning visual complements to the talks; however, the real lack of new theoretical developments in the field was a major disappointment to most participants.

Doug Gies addressed the Toronto Centre of the RASC on Friday February 20. His title was "Is It or Isn't It? - The Continuing Story of Cygnus X-1". (He says it is!)

As mentioned in the item on Priorities in Astronomy (p. 4), *Tom Bolton* is chairing the CASCA-ACA subcommittee on National Facilities. This subcommittee will be considering the desirability and feasibility of creating a national facility for astronomical image processing and data analysis.

Dennis Crabtree attended the 14th Canadian Decus Symposium February 18-20 in Montreal. VAX users can look forward to a few added features in VMS 2.2 (scheduled for March release) as well as totally revamped BACKUP and RESTORE utilities near the end of the summer. (For readers who haven't been at Toronto recently, we mention that the VAX is the Astronomy/Physics dedicated research computer, situated on the 8th floor of the Burton Tower.)

COLLOQUIA*

- March 11 *Lale Akatli and Leif Schioler, University of Toronto*
G2000 - Current Literature Seminar
- March 18 *Mordehai Milgrom, Institute for Advanced Study, Princeton*
"The Double-Beam Model for SS 433"
- March 25 *T.B.A.*
- April 1 *Robert L. Brown, NRAO, Charlottesville*
Topic T.B.A.
- April 8 *T.B.A.*
- April 15 *Georges Michaud, Université de Montréal*
"The HgMn Stars"
- April 22 *Paul Herget, University of Cincinnati*
Topic T.B.A.
- April 29 *Douglas Gies, University of Toronto*
"Spectrophotometry of Cygnus X-1"

* Unless otherwise noted, colloquia are held on Wednesdays at 4:00 P.M.
in Room MP 134 with TEA at 3:45 in the Reference Room, MP 1404.

PAPERS SUBMITTED

- J.D. Fernie Note on the Nature of HD 179315
R.F. Garrison
- C.C. Dyer Towards a Realistic Nebular Gravitational Lens
R.C. Roeder
- C.W. McAlary Two-Four Micron Spectrophotometry of NGC 4151
R.A. McLaren
- P. Biermann VLBI and X-Ray Observations of Compact Nuclei in Pairs
P.P. Kronberg of Galaxies
E. Preys
R.T. Schilizzi
D.B. Shaffer
- J.R. Percy A Search for Light Variations in F- and G- Type Supergiants II
D.L. Welch
- H.S. Hogg The Sounds from Distant Space
D.E. Hogg

MORE ON CHARON AND PLUTON

Keeping informed about Pluto has been part of the game for 51 years this month, and the pace of discovery has noticeably quickened since the discovery of Charon in 1978. There is a good review in Sky and Telescope for June, 1980. In the same month two French astronomers, D. Bonneau and R. Foy, used the Canada-France-Hawaii 3.60 m to observe Pluton (as the French say) by speckle interferometry. Inasmuch as one textbook in wide use here at U. of T. doesn't even mention Charon, it may be useful to list the CFHT results, which appeared in Astron. Astrophys., 92, L1, (Dec. 1980).

	Pluto		Charon	Remarks
Observed diameter	4000 km		2000 km	±10%
Observed Δm_V		1.6 mag		±0.2
m_V at opposition	15.3		16.9	
Deduced albedo	0.20	≈	0.20	+0.04 -0.03
New orbital i		100°		little change
New orbital a		22,000 km = 1!02		14% increase
Old orbital period		6d3867		
New system mass	2×10^{25} g	= 1/300 \oplus - mass		
Upper limit density of Pluto		0.6 g cm ⁻³		
Assume equal density	0.5 g cm ⁻³	≈	0.5 g cm ⁻³	
Then masses:	1.8×10^{25} g		0.2×10^{25} g	
	1/300 \oplus - mass		1/3000 \oplus - mass	
	1/4 - mass		1/40 - mass	

Pluto no longer seems to be the planetary body it was once thought to be. The Doings (January 31, 1980) was perhaps the first to suggest that Pluto/Charon should be considered a double planet. Or is it an escaped double satellite, or double comet?

Any way we look at it, so long as Pluto retains its symbol \oplus , Charon ought to have one too, and we suggest $\opl�$

MR

The Department of Astronomy and the David Dunlap Observatory of the University of Toronto cordially invite you to attend the JUNE INSTITUTE 1981. It will be held in the McLennan Physical Laboratories from MONDAY, JUNE 1 TO WEDNESDAY, JUNE 3, inclusive, with a Welcome Party at 96 Wells Street on the evening of SUNDAY, MAY 31. Three of North America's leading young astronomers will each present three lectures on topics related to recent developments in astronomy and astrophysics. The speakers and their major fields of interest are:

BRUCE G. ELMGREEN, Columbia University:
Interstellar Matter, Star Formation,
Microwave Astronomy.

ROBERT P. KIRSHNER, University of Michigan:
Extragalactic Astronomy, Supernovae.

SCOTT D. TREMAINE, Institute for Advanced Study:
Planetary, Stellar and Galactic Dynamics.

The proceedings will be informal, and there will be many opportunities for the speakers and participants to meet together, during the day and at evening social events.

Senior undergraduate and graduate students, faculty members and other scientists whose interests lie in one or more of these fields are invited to attend.

If you plan to attend, please send the attached form to me at the address below, by May 15.

Come and share three days of stimulating astronomy with us! Stay on and enjoy the many facets of our city!

John R. Percy
Department of Astronomy
University of Toronto
Toronto, Canada M5S 1A7

1. Name.....

Address.....

.....

Position.....

2. I will require accommodation in the University residences for the following dates:

May 31..... June 1..... June 2..... June 3.....

Single..... Double.....

If double, I will be sharing a room with.....

The daily cost of accommodation will be about \$16.50 single and \$11.00 double. Children cannot be accommodated in the University residences.

3. I plan to attend:

Welcome Party (Free) May 31, 8.00 p.m.

Institute Dinner (About \$12) June 2, 6.00 p.m.

4. I would also be interested in visiting:

The David Dunlap Observatory

The McLaughlin Planetarium

A registration fee of \$10 (students) and \$15 (others) will be charged for participants from outside the University of Toronto. This covers the cost of coffee and donuts, the Welcome Party, etc. Please be prepared to pay this in cash or traveller's cheques on June 1. Residence charges must be paid at the residence upon check-in, in cash or traveller's cheques.

RETURN THIS FORM BY MAY 15 TO THE ADDRESS SHOWN OPPOSITE