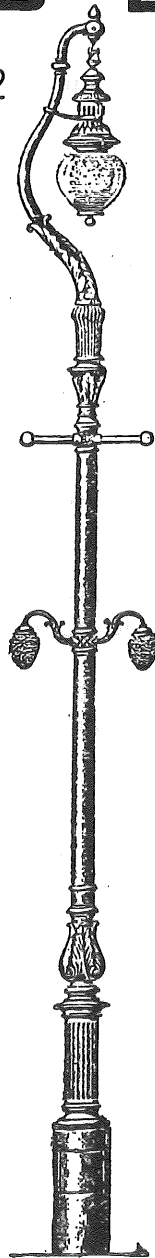


# DAVID DUNLAP DOINGS

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*Ah,  
for  
the  
good  
old  
days!*

*See p. 2*

DEVELOPMENT AND LIGHT POLLUTION NEAR THE OBSERVATORY

*by Tom Bolton*

No one who has been awake on the drive out to the David Dunlap Observatory from the St. George Campus could fail to be concerned about the future of the Observatory. The area around and to the south of the Observatory is obviously developing explosively. Perusal of the Richmond Hill and Toronto newspapers will almost invariably turn up news of several more potential threats every week. The list of developments proposed, planned, or under construction that pose direct, serious light pollution threats to the Observatory is truly staggering. The list of potential problems includes, among others:

1. Hillcrest Mall at Yonge and Carrville Rd. (under construction)
2. Baif subdivision in the area bounded by Yonge, Carrville, Bathurst, and Weldrick Rd. (under construction)
3. Reconstruction of Yonge Street between Highway 7 and Markham Rd. (planned)
4. Highway 407 to replace Highway 7. (planned)
5. Highway 404 (Don Valley Expressway extended) along Woodbine-Don Mills (planned)
6. Bayview widening (under construction from Steeles to Highway 7, planned from Highway 7 to Gormley sideroad)
7. Several major housing developments and a civic centre along Bayview south of Highway 7 (under construction and planned)
8. A \$150,000,000 domed stadium plus an associated commercial and industrial complex on the Langstaff Jail Farm (proposed).

In addition, the Town of Richmond Hill now has underway a planning study of the South Yonge Street corridor (Markham Rd. to Highway 7). Some of the preliminary proposals made by the planning consultants hired by Richmond Hill would be extremely damaging to the Observatory. Some of these proposals would place moderately high density housing along Yonge Street near the Observatory,

and commercial, office, recreational complexes around the Yonge-Carrville Rd intersection. One proposal, which is backed by several major Richmond Hill politicians, would permit - indeed encourage - the construction of a domed stadium on the Langstaff Jail Farm.

In the face of all of this it might seem that the future of the Observatory is very bleak, but that is not necessarily the case. It will clearly be impossible to stop most of the development around the Observatory, but it should be possible to obtain some controls on the type of development permitted near the Observatory as well as controls on the type of lighting that is to be installed. Such controls would significantly prolong the useful life of the Observatory.

Jack Heard and Don MacRae began to contact local governments about ten years ago in an effort to win some controls on development and lights near the Observatory. Their preliminary efforts bore fruit about three years ago when the Baif subdivision and Hillcrest Mall were being planned. At that time the Town of Richmond Hill, which had recently annexed all of the land south to Highway 7, adopted a light pollution control policy at the urging of the Observatory. This policy, which is based on the Tucson light pollution ordinance, gives the Observatory veto power over the lighting plans of any new development. In addition a condition for the issuance of building permits to modify existing structures is that the plans include provisions for bringing all exterior lighting to Observatory standards. The Town has also agreed to begin shielding all of their street lights.

For the past two years I have been largely responsible for the DDO light pollution control program, and I'm happy to report that Richmond Hill has followed their adopted policy. It enabled us to win a number of concessions in the design of the Hillcrest Mall and Baif subdivision. All lights in these areas will be shielded, and they will be filtered to remove light shortward of 4400A when a suitable filter can be found. Most of the Mall lights will be extinguished when the Mall closes. We also won a number of concessions on architectural design and location of interior and exterior lights. In addition, we were able to require the developer to replace some unacceptable lights that were installed in the subdivision without our approval.

In spite of successes such as these a number of problems remain. Because Richmond Hill is operating under an informal policy with no formal standards it has been necessary to deal with each problem on an *ad hoc* basis. This has resulted in such great

demands on our resources that it has not been possible to do much about problems outside the Town of Richmond Hill. In addition we have found that developers are very resourceful at finding loopholes in unwritten policies. We have therefore, asked that Richmond Hill adopt a light pollution control by-law, and we have set forth for inclusion in the by-law a number of standards regarding the quality, quantity, and location of lighting as well as the architectural design of buildings. We have also asked that an amortization schedule be adopted for all existing non-conforming lighting.

If we can get such a by-law adopted, we can then turn more of our attention to surrounding municipalities and the provincial government. We have made a few promising preliminary contacts, particularly in the City of Toronto, but these will have to be pursued vigorously. We will also try to get the Langstaff Jail Farm added to the Green Belt that has been set aside by the Province. If we can do this, it should effectively eliminate any possibility of an Astrodome being dropped on our southern doorstep.

#### OBSERVING

##### An Interesting New Eclipsing System

Photometric observing conditions are infrequent here at this season, but Don Fernie happened to catch a few hours on February 7 at the exact time of a predicted possible eclipse of the double-line Am spectroscopic binary HD 82191 studied recently by Heard and Hurkens (J.R.A.S.C. Dec/73). The results seem to indicate a very shallow ( $0^m.03$ ) eclipse of about three hours duration. What makes this observation interesting is that, if the eclipse is confirmed, an exact computation of the stellar masses becomes possible, perhaps the best mass determination of an Am star inasmuch as very few Am eclipsing systems are known.

Don invites observers elsewhere to try to confirm the eclipses and lists the following epochs of eclipse: JD 2442113.601, ...22.613, ...31.625, ...40.637, ...49.649 and JD 2442158.660 ...67.672 ...76.684, ...85.696, ...94.708.

##### Las Campanas

Bob Garrison, returned from Chile on Jan. 29, reports an excellent observing run resulting in classification spectrograms of over 500 bright stars south of the equator.

Chris Smith writes that he has washed the mirror of the 24-inch ("it looks great") and has re-aligned the polar axis which was 3' 48" off. - *Earthquakes?*

#### COMINGS AND GOINGS

Don MacRae was in Washington on Feb. 13 for an executive committee meeting of the Board of USRA and was in Honolulu on Feb. 20-23 for the meeting of the Board of the CFHT Corporation. He visited Simon Fraser University and DAO on February 18 and 19th.

Austin Gulliver left on Feb. 18 for two weeks at the Hale Observatories where he plans to search the plate files for spectrograms of his shell stars.

Sidney van den Bergh visited UWO on Jan. 23-24 and Queen's on Jan. 25 on behalf of the NRC Grants Selection Committee. At Western he gave a talk on "Supernova Remnants" on Jan. 24.

Seventeen students, staff and friends attended a most "successful" (!) and enjoyable GASA-sponsored tour of Molson's Brewery Ltd. on Feb. 6.

Jack Heard was in Ottawa Feb. 6-8 to attend committee and Council meetings of the Royal Society of Canada.

#### SEMINARS

FEBRUARY As announced in DDD 7,1 except:

Tues. 5th, DDO Tom Bolton, "Report on Research"

Tues. 26th, DDO Sidney van den Bergh, "Recent Galactic and Extragalactic  
4:00 p.m. Observations", and Rene Racine, "The Metallicity of Globular Clusters in M87".

and Dr. Newell's topic on Feb. 21st was "The Advanced Evolution of Population II Stars".

and Dr. Michael Ovenden's topic on Feb. 28 was "The Lost Planet - Some Speculations on the Evolution of the Solar System".

MARCH

Tues, 5th DDO Don Fernie, "The Historical Denial of Interstellar Matter"  
4:00 p.m.

MARCH SEMINARS cont'd

- Mon. 18th                    Dr. Myron Lecar, Centre for Astrophysics, Smithsonian  
McL. 134 4:00 p.m.        Astrophysical Observatory, "On Bode's Law".
- Tues. 19th                   Dr. Lecar, "The Original Distributions of the Asteroids"  
DDO                    4:00 p.m.
- Tues. 26th                   Ernie Seaquist, "Circular Polarization of Quasars"  
DDO                    4:00 p.m.

PAPERS SUBMITTED IN FEBRUARY

- F.J. Ahern                    An Improvement in the Ratio Method of Fourier Spectrometry  
C. Pritchett
- S. van den Bergh            Photometry of Stars in the Nuclear Bulge of the Galaxy  
& E. Herbst                through a Low-Absorption Window at  $l = 0^\circ$ ,  $b = -8^\circ$ .
- W. Herbst,                    The 71 sec Variation of DQ Herculis  
J.E. Hesser &  
J.P. Ostriker
- P.C. Keenan                   Revised Catalogue of Spectra of Mira Variables of Types  
R.F. Garrison &            Me and Se  
A.J. Deutsch
- P.C. Gregory                 Radio Emission from R Aquarii  
E. Seaquist
- J.D. Fernie                   The Ratio of Total to Selective Absorption from RS Puppis
- S. Demers                    The Instability Strip of Population II Cepheids  
W.E. Harris
- C.T. Bolton                   Spectra of SN 1972e, IN NGC 5253  
R.F. Garrison  
D. Salmon  
N. Geffken

P O T P O U R R I

Engaged

*Gretchen Hagen and Bill Harris have let it be known that they are engaged to be married, the wedding probably to take place*

next summer. DDD wishes Gretchen much happiness and congratulates Bill. Congratulations also to Gretchen for her successful defence of her thesis on Feb. 15.

#### Tenure

Bob Garrison was granted tenure at a Tenure Committee meeting on Jan. 30.

#### Talks

John Percy gave a talk on Jan. 28 at Lorne Park Secondary School on "Recent Developments and Discoveries in Astronomy at the University of Toronto", and on "Intelligent Life in the Universe" at Northview Heights Collegiate on Feb. 12. (The title of John's talk to the Niagara Falls Centre of the R.A.S.C. on Jan. 10, reported in the Jan. DDD, was "Recent Discoveries Among the Naked-Eye Stars".

#### Cassiopeia Deadline

March 4 is the deadline for copy for the Spring Equinox number of Cassiopeia. Copy may be given to J.F.H. or sent directly to David DuPuy, Burke-Gaffney Observatory, St. Mary's University, Halifax.

#### King Library Features Astronomy

Don MacRae has received a letter of thanks from Mrs. Bernice Ellis, Chief Librarian of the King Township Public Library for the loan of charts and films exhibited at the library and at King City schools and for arranging a talk by Dieter Brueckner. The King Library has plans to develop further its astronomy and space programs.

#### NRC Associate Committee to Meet

The final meeting of the 1971-74 NRC Associate Committee for Astronomy will take place on March 1-2 at Queen's University, the main item of business being discussion of the draft report on future plans and rationale for Canadian Astronomy which has been put together by Phillip Kronberg from sections submitted by a number of Committee members.

#### Death of Two American Colleagues

Death has claimed two more prominent American astronomers: Charles G. Adams on Dec. 17 at age 101 (see Sky and Tel., Feb.) and Fritz Zwicky on Feb. 8 at age 78.

#### RCI celebrates

On Feb. 16 the Royal Canadian Institute celebrated, at one of its regular meetings, the exact 125th anniversary of its first meeting. Helen Hogg, a past-president of the RCI, was there, as also was Don Fernie. Don, as Vice-President of the R.A.S.C., read messages of greetings from the Society and from Helen Hogg as Honorary President of the Toronto Centre.

## FINAL ITEM

### *The Carpenter's Chronometers. I.*

Celestial navigation hardly rates very high on today's list of pressing astronomical problems. But once it did; once, a couple of centuries ago it was in fact the mainspring for much of astronomical research. The first great modern observatories were founded specifically for the study of navigation, and although in the end the main difficulty found a non-astronomical solution, the creation of those observatories and the work done in them had an immense impact on the history of astronomy proper.

This main difficulty was the problem of determining longitude at sea. Latitude is a fairly easy matter, since it can be found by measuring angles only, but longitude involves a knowledge of time. One must have a means of knowing at any given moment what the Greenwich Mean Time is, even though one's ship be in the middle of the Pacific and months out from port. (Very modern methods do away with this necessity, but historically it was so.) Clearly, an accurate clock is the answer, but in the early days none was available. By the early 1700's good pendulum clocks were available, but of course, were no good at sea, while existing watches were so hopeless that many dispensed with a minute hand altogether. This was how the astronomers got into the picture. It was hoped that celestial phenomena could provide the necessary clock. For example, the moon moves so rapidly among the stars that even a mariner's sextant can give a good enough measure of its relative position to say what the time must be. The only hitch there is that the mariner must have tables which relate the moon's position to the time, and the prediction of those tables caused a fearful number of astronomical headaches. Thus, despite great effort, the astronomical attack on the problem was a slow one.

Meanwhile, more and more ships ploughed the seas in dismal ignorance of their positions. Not only were valuable cargoes forever being lost in shipwrecks, but the toll in lives was appalling. There was Sir Cloudsley Shovel, for instance, returning to England from Gibraltar in 1707 and running into heavy weather. His navigators all agreed the fleet was off Ushant, although an ordinary seaman had the temerity to advise his superiors that he reckoned otherwise. While he was being sentenced to swing from the yardarm for his mutinous attitude, the fleet sailed in accordance with the navigator's decree, ran head-on into the Scilly Isles, and lost four ships and two thousand lives, Sir Cloudsley's among them. Some solution had to be found.

How urgent the problem had become can be judged from the changed attitude of the British Admiralty. When the Royal Observatory at Greenwich had been founded in 1676 for just this reason, it had been specified that it was not to cost more than £500. Even this sum had to be raised by the sale of old and decayed gunpowder to merchants who did God-knows what with it, the wood for the building had to come from an old demolished gatehouse, bricks from a demolished fort, and the incumbent astronomer was paid £100 a year (£10 withheld for taxes) and had to provide his own instruments. But now, in 1714, Parliament on behalf of the Admiralty was offering a prize of £20,000 for anyone who could come up with a method for determining longitude to within half a degree. That's a lot from an outfit which even in the mid-twentieth century (I speak from experience) stamped the head of every thumb-tack with the warning 'Property of



the Admiralty'. (Yes, they had unusually large heads.)

A twenty thousand pound prize was the clarion call for every crank in the kingdom to set to work. There had already been a good many. Back in 1687 someone had discovered that a full glass of water overflowed at exactly full moon and new moon, so that if the times of these phases were predictable longitude could be found twice a month. A much superior method, however, involved a nostrum called "the powder of sympathy". This healed wounds of every kind, but unlike most such anodynes, had to be applied not to the wound but to the weapon that had inflicted it. Thus every ship was to be equipped with a wounded dog, the wounding weapon (a bandage from the wound would do) was to be left on shore where every hour on the dot someone would dip it in the powder of sympathy, at which moment the dog at sea would feel a surge of healing and obligingly yelp an announcement. Then there was the idea of anchoring rocket-firing lightships every few miles across the Atlantic, it being known that that ocean is "nowhere more than 300 fathoms deep".

The Board of Longitude, which was the committee set up to administer the prize, and so had to pass judgement on all these schemes, found it necessary to have a secretary to send out their regrets to most applicants. Thus when a Dr. Woeman wrote "acquainting the Board that he can express  $\pi$  and the ratio of 1 to  $\sqrt{2}$  in integrals, and that this comprehends the discovery of the Longitude, he was informed that the Board do not receive proposals of this kind." Mr. Owen Straton had to be told that a sundial would not win the prize, and "M. Metiriet was informed that the Board declined any interference with the quadrature of the circle". John Baptist made such a nuisance of himself over some incomprehensible scheme that he had to be rather forcefully "desired to withdraw".

The astronomers, of course, were as eager as anyone to get their hands on that £20,000. Edmond Halley had already been out bobbing around the Atlantic in the hope of calibrating longitude in terms of the variation of the magnetic compass, Nevil Maskelyne was determined to make the lunar method practicable, while others were working at making accurate predictions of the times of eclipse and occultation of Jupiter's satellites, so that these would also be a kind of celestial clock. Isaac Newton had little faith in such ideas, considering them to be "true in the Theory, but difficult to execute". He preferred a straightforward "Watch to keep time exactly: But, by reason of the Motion of a Ship, the Variation of Heat and Cold, Wet and Dry ... such a Watch hath not yet been made".

And indeed, the conditions of the prize made very stringent demands on any such timekeeper. If a navigator were to be able to find his longitude to within half a degree at the end of a typical six-weeks voyage, it meant that the clock must have a rate constant to within three seconds a day. So impossible did this seem, and so wild were the alternative schemes presented, that the Board of Longitude became the butt of every cartoonist and satirist in London. The Board failed to see the joke, and suffered on.

But there was a man who believed he could build such a clock, an unlikely country carpenter of twenty-one named John Harrison. It would take him the rest of his life to achieve his ambition, and even that effort was minor compared to what it took to get the prize money out of the Board. Fortunately he was a Yorkshireman. Next time we'll look at how John Harrison came to invent the marine chronometer and his endless battles with the Board of Longitude.