



DAVID DUNLAP DOINGS

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Memoranda.

1841 July 3. Formed a design, in the beginning of this week, of immediately setting, as soon as possible after taking my degree, the irregularities in the motion of Uranus, which were yet unaccounted for; in order to find whether they may be attributed to the action of an undiscovered planet beyond it; and if possible hence to determine the elements of its orbit, & approximately, what probably led to its discovery.

The memorandum written by John Couch Adams announcing his intention of investigating the possible existence of a trans-Uranian planet. See Final Item.

EDITORIAL

The Solar Eclipse of January 24, 1925

As all astronomers know, the incidence of total solar eclipses at a given place is almost vanishingly small, so that very few people would see one in a lifetime if they didn't purposely go into a path of totality. Since 1497, for example, only two paths of totality have come within 200 miles of Toronto: those of June 16, 1806 and January 24, 1925. The path of totality of the 1925 eclipse included all of Toronto, though not centrally by any means.

At the time of the 1925 eclipse I was in final year of high school in St. Thomas and, because the eclipse was total in London and not quite total in St. Thomas, I asked permission of Prof. H. R. Kingston of U.W.O. to join his observing group on campus. So I took a very early train to London (20 miles) and for my pains saw only clouds, while my parents watched a wonderful all-but-total display from the windows of our house.

I was reminded of the 1925 eclipse in Kingston last month by Alan Clark of the U. of Calgary who said someone had given him a copy of the Toronto Globe (before the merger with the Mail) of Monday Jan. 26, 1925 which devoted most of page 1 to the "observations" in and about Toronto. Upon his return to Calgary Alan sent me a Xerox of the first page. As our former colleague, Ralph Williamson, used to say, it is interesting in a dull sort of way. One can see what happened: the papers must have built up the great event for weeks ahead but, as one headline put it, "nature draws heavy curtain before heralded spectacle", so the reporters could do little beyond make rather corny fun of the whole thing or try to cook up human interest angles.

The serious scientific parties had chosen Long's Corners near Hamilton as their site, it being almost exactly on the centre-line. Dr. Chant and Dr. Young had assembled again the 45-foot camera lens with which they had succeeded in observing the Einstein effect in Australia in 1922. Professor Melson of "S.P.S." (Applied Science) had equipment for measuring shadow bands, Father Morton, President of the Winnipeg RASC, had a telescope, as did Dominion Astronomer R. Meldrum Stewart. They and others are pictured standing glum and bundled and shivering in the snow.

Only one reporter had some measure of success to write about. Flying a "swift", new 176 h.p. Lynx-Avro at the amazing speed of 85 m.p.h. at its ceiling of 12,000 feet, Flight Lieutenant Brookes and Flying Officer Morphy of the Royal Canadian Air Force are reported as having obtained a few photographs of totality through holes in the cloud cover with a 20-inch lens. The paper doesn't reproduce the photographs, but if they were any good the feat may have been a first in the annals of eclipse observing.

J. F. H.

Corrigenda

In the Editorial of vol. 8 no. 5, p. 2, 3rd para for Hon. Robert Borden read Hon. R. B. Bennett. It was Bennett who was supplanted as Prime Minister by W.L.M. King in 1935. Borden was the first-world-war Prime Minister (actually 1911 to 1920).

On p. 8 para 4 of vol. 8 no. 5, writing about the new display in the outdoor display case at the Observatory, we failed to give Thor Prociuk the credit due him for the concept and detailed planning of the display which was so well executed by Gerry Longworth. Thanks to the good teamwork it is an excellent display.

COMINGS AND GOINGS

Christine Coutts on her way home from Chile gave a talk on May 19 at the Institute for Astronomy and Space Physics on "The Unusual Period Distribution of RR Lyrae Variables in the Globular Cluster IC 4499".

Tom Bolton spoke on "Optical Observations of Non-pulsating Binary X-ray Sources" at Northwestern University on March 24. Tom left on July 19 for Varenna, Italy to attend the last week of the course on Physics and Astrophysics of Neutron Stars and Black Holes, giving a lecture on "Optical Observations of X-ray Sources" as part of the course being given at the Enrico Fermi Summer School. From July 28 - Aug. 1 he will attend the IAU Symposium No. 73 on "Structure and Evolution of Close Binary Systems" and present a paper on "C/N anomalies in OB Stars".

Helen Hogg attended the Royal Society of Canada meeting in Edmonton June 1-4. Following this she spent four days at Yellowknife, a day at Coppermine, and flew back from the N.W.T. by way of Churchill and Winnipeg. After attending the CASCA meeting in Kingston, June 19-21 (where she gave a paper in the History of Canadian Astronomy section) she went to Ottawa on June 23 to represent the Observatory at the unveiling of the plaque commemorating William F. King. On July 3 and 4 she was in Ottawa again as one of the 12 living Canadian women scientists being honoured by a museum display of their work. At a reception marking the formal opening of the display at the National Museum of Science, Director L. Lemieux introduced the nine of the ladies who were able to be present. Helen and three others of those honoured gave talks on their work. Helen's display featured a precision model of the 74-inch telescope which had been constructed by Gerry Longworth on a scale of 1:32. The display will remain in Ottawa until September and then go on a three-year tour across Canada.

Don Fernie attended the CASCA meetings in Kingston, giving a paper on π Aqr, then the RASC General Assembly in Halifax June 27-29 where he presided, then had ten days holiday with his family in the Maritimes and New England. From July 12 to 20 he attended the IAU/IUHPS Symposium celebrating the Tercentenary of the Greenwich

Observatory. On July 28 he is representing the RASC at the International Union of Amateur Astronomers in Hamilton and giving a talk. Helen Hogg will be there too.

Robert Roeder was in Montreal June 24-25 for a meeting of the organizing committee for the XVII General Assembly of 1979.

Jack Heard attended the R.S.C. meeting in Edmonton June 1-4, with his wife visited their daughter and family in B.C. and the Wrights in Victoria and then went to the CASCA meetings in Kingston.

Sidney van den Bergh was at the Kingston meetings in June, observed at Palomar July 15-18, spoke on "Stars, Gas and Galaxy Evolution" at the RGO Tercentenary Symposium at Herstmonceux July 23.

Bob Garrison attended the Kingston CASCA meetings and more recently (July 7-12) attended IAU Symposium No. 72 on "Abundance Effects in Classification" in Lausanne, Switzerland, visited Haute Provence Observatory July 14-15 and then enjoyed a short vacation in France with daughter Alexandra who had accompanied him to Europe.

Don MacRae attended the Kingston CASCA meeting, giving a short talk and showing the film of the 1935 opening of the Observatory. During the week of June 23 he went to Paris for a meeting of the CFHT Directors and, on the way home, he attended the RASC General Assembly in Halifax, giving a talk on the CFHT at the Sunday buffet dinner, and with wife Betty revisited scenes of his Halifax childhood.

John Percy attended the CASCA meeting in Kingston giving a paper on "Period Changes and Evolution in Pulsating Variable Stars". He also attended the RASC General Assembly in Halifax. John and Don Fernie had attended the NRC Associate Committee's Subcommittee on Education in Massey College on June 2.

Some others who attended the Kingston CASCA meetings were René Racine (The Reddening of Globular Clusters), Bruce Campbell (The DDO Reticon System), Robert Smith (On Fragmentation in a Collapsing Gas Cloud), Maurice Clement, David Turner.

Peter Martin had a successful observing session with the 90-inch telescope of the Steward Observatory May 19-23, making measurements of the polarization of Seyfert nuclei to assist in identifying the emission mechanism producing the optical continuum and investigating an extreme example of interstellar circular polarization. Peter also spent May 28-30 at the Center for Astrophysics in Cambridge with George Rybicki, his collaborator on radiative transfer in dust shells.

SEMINARS

JUNE

This year's June Institute, the ninth, held June 10 through 13, proved to be even more popular than others of recent years. This, no doubt, was largely due to the excellent slate of speakers, which drew a large audience of outsiders as well

as the staff and students of the Department.

Martin Schwarzschild spoke on topics in stellar structure and evolution, Mort Roberts reviewed the present status of extragalactic 21-cm radio astronomy, Carl Sagan spent most of his time discussing the Mariner and Viking Missions to Mars, while Cliff Will managed to attract both theorist and observationalist in his review of gravitational theories and experiments to test them. A new Institute record of sorts was set when Carl Sagan's lecture on Extraterrestrial Life - the concluding lecture of the four-day series - drew so large an audience that additional chairs had to be brought in to fill the aisles. Almost the highpoint of the lecture was the final slide, which, under the guise of 'continuation of biological species', was found to read "Congratulations Christine and Maurice".

As usual, the social events proved as popular as the technical ones. The Monday night party at Dave Hanes', Open House at the Observatory and reception at the MacRaes' on Tuesday, the graduate students' party at the Croft House on Wednesday, and the Institute Dinner at the Moon Wah Chinese restaurant on Thursday (the choice of Steve and Lys Shore after thorough research) were all received enthusiastically.

Our thanks are owing again to John Percy and his committee for a good job of organizing and to Esther, Elizabeth and Margaret for the secretarial work and the refreshments.

JULY

Tues. 8th
DDO

Sidney van den Bergh, "Stars Gas and Galaxy Evolution".

AUGUST

None announced

PAPERS SUBMITTED IN JUNE and JULY

R. Racine "UBV Photometry of Faint Globular Clusters"

W.E. Harris,

R. Racine & "New Color-Magnitude Diagrams for Four Southern Globular
J. deRoux Clusters"

S. van den Bergh "The Nucleus of M33!"

P O T P O U R R I

Departmental Nuptials

Christine Coutts and Maurice Clement announced their engagement in June and are to be married in a family ceremony at Christine's home on July 30.

Margaret Gallagher of the Departmental office staff was married on June 14 to Mario Rao.

GASA News

The new officers of the Graduate Students' Association are Steve Shore, president; Martine Normandine, vice-president; Dot Fraquelli, secretary; Gerry Diamond, treasurer; Thor Prociuk, G.S.U. Rep. Dot and Steve are the student representatives at staff meetings.

G.A.S.A. hosted their customary midsummer picnic on July 17 on the Observatory lawns. Tom Bolton's "over the hill gang" defeated René Racine's "Gulliver's Walks", by 23 - 10 in a thrilling, cliff-hanging baseball game.

Alumni

A letter from Bill Sherwood (M.Sc. 1967) saying that he and Vicki (Watt, M. Sc. 1967) have moved from Bochum to Bonn where Bill has a job at the Max-Planck-Institut für Radioastronomie, 53 Bonn, West Germany. He is working in the IR Group under Dr. G. Schultz, studying OH/IR sources and HII regions, among other things.

Bob Deupree (Ph.D. 1974) writes from Princeton to say that he has accepted a two-year post-doctoral position at the Los Alamos Scientific Laboratory to do further work on non-radial hydrodynamics in stars. Among the benefits: three CDC 7600's and his own computer programmer!

Resignation

It was with mixed feelings that we had a good-bye tea on June 18 for Elizabeth Barnes who has left her secretarial job in the Department after 2½ years. We were sorry to lose her, but her new (and better) job is in the University and we hope to see her from time to time.

Appointments

The teaching staff appointment which the Department has been advertising for the past few months has been filled by the acceptance of an offer by Dr. Robert McLaren, a graduate of the U. of T. whose most recent research position has been at Berkeley with Dr. Charles Townes. The appointment (which is shared to the extent of 20% by the Department of Physics) will commence on December 1.

Miss Ruth Hofbauer has joined the office staff in the Department of the St. George Campus and will assist Esther in much the same way as Elizabeth did.

John Percy has become a contributor and Advisory Editor for the Cambridge Encyclopaedia of Astronomy (spiritual successor to the "Larousse"). Barry and Kathy Madore are also Contributors.

Ted Bednarek has accepted a one-year teaching appointment in the Physics Department at St. Mary's University, filling in for George Mitchell who will be on sabbatical leave. As part of his interview on June 22-23, Ted gave a seminar at St. Mary's on his thesis topic.

Appointments cont'd

NRC Post-doctoral Fellowships have been awarded to three up-coming Ph.D.'s: Austin Gulliver, Serge Pineault and Chris. Pritchett.

John Perkins is working in the Department for the summer as editorial assistant to John Percy for the Observer's Handbook.

FINAL ITEM

The Adams-Leverrier Affair. I.

When I first started writing these columns I said they would contain well-known as well as little-known stories, but in retrospect I see I have tended to avoid the more renowned tales. So perhaps it is time to look at one of the most famous incidents in the history of modern astronomy, a *cause célèbre* that not only produced an international uproar, but one that is extraordinarily illuminating in terms of human character. This was the discovery of the planet Neptune in the 1840's, and the roles played in that event by two young men: John Adams and Urbain Leverrier.

The story really goes back to the night of March 13, 1781, when a local organist and minor composer in the English city of Bath, indulging in his hobby of amateur astronomy, happened to turn his six-inch reflector on a 'star' that appeared to show a distinct disk. This, of course, was William Herschel discovering the planet Uranus, the occasion that started his conversion from minor musician to the greatest observational astronomer of his day. Things got off to a slow start, however, because Herschel thought he had discovered just another comet, and threw everyone off the track by announcing that it had a diurnal parallax of 10 to 20 seconds of arc. It wasn't until that summer that it was realized from continuing observations of the object that it was really a new planet, the first ever to be actually discovered.

The immediate challenge was to calculate the orbit of the new planet, but here something of a problem arose. Since Uranus is so far out in the solar system it moves very slowly, and the few months of observation were not sufficient to calculate an accurate orbit because so little of the orbit had been traversed in that time. Before long, however, several astronomers, notably Johann Bode, realized that because Uranus appears as only a very small disk, previous generations of astronomers might well have mistakenly recorded its position as a star. Using the available observations to calculate roughly where the planet would have been in the past, they began a search of old catalogues to find any records of a 'star' in positions where, in fact, it was now known that no stars existed. Sure enough, human frailty did not fail them, and Bode soon found several such earlier observations. One, by John Flamsteed, went back almost a hundred years (if you ever wonder why there's no 34 Tauri, it's because that 'star' was Uranus).

With these more distant observations to hand, astronomers attempted to calculate a precise orbit for Uranus. Curiously though, it proved impossible to represent both old and new observations with a single set of elements. Those that satisfied the new observations gave errors of position for the old observations of sometimes as much as 45 seconds of arc. Yet the earlier observers were known to have been generally accurate to within a few seconds. The best that the orbital experts could come up with was to blandly shrug away the few early observations as being unaccountably inaccurate. Clearly more such early observations would be very useful.

The early years of the nineteenth century saw European astronomy somewhat in decline, what with Napoleon and Wellington rampaging around the Continent. It was a good time to hole up in one's library and dig into old records and catalogues. In this way a good many early observations of Uranus came to light. Flamsteed had actually observed the planet six times without realizing it, while Pierre Lemmonnier took the record at eleven observations, six of them made in nine days without noting anything amiss. The search seems to have been exacting; one of Lemmonnier's observations was turned up scribbled on a brown paper bag previously used for hair powder. Evidently both observing records and library standards were a little different then.

But things only went from bad to worse. Despite the mathematical abilities of such as Bode and Bessel, the early observations could not be reconciled with the later ones. Alexis Bouvard worked the hardest at these orbital calculations, and it was he who found that by 1820 the current observations could not even be reconciled with those made at the time of discovery. As usual there was no dearth of imaginative explanations. Perhaps Descartes had been right and there was a 'cosmic fluid' dragging on Uranus; perhaps Uranus had a massive satellite swinging it out of position; perhaps it was being buffeted by a barrage of comets; perhaps Newton's law of gravity required modification at such large distances (a view favoured by Airy, the Astronomer Royal). None of these proved viable. The problem became the hottest topic in theoretical astronomy, academies offered prizes for its solution, but no acceptable solutions were forthcoming.

And there the matter stood in 1841 when a 22 year-old second-year undergraduate at Cambridge University, John Couch Adams, wrote the memorandum reproduced on our front cover. In it he announced his intention, once he had his degree, of seeing whether the motions of Uranus could be explained by the presence of a yet more distant planet, and if so to calculate its position so that it might be discovered.

This idea for explaining Uranus' behaviour was nothing new; in fact, by 1840 it was the most popular explanation going. But the mathematical difficulties of the undertaking were so horrendous that none of the established celestial mechanics had even approached the details. One had to be either a genius or an undergraduate to even think of tackling it. But then John Couch Adams was an unusual undergraduate.