



DAVID DUNLAP DOINGS

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Copernicus first discover a telescope for himself, and start to look at the outer space of the sky and we can claim him to be the first people to study astrophysics and this lead to the latter study of the astronomy. Tycho believe the study of the other planets are of different shape and different properties, Kepler derived his three laws of motions which played an important part of the modern astronomy. He tells us the orbit of a planet is an ellipse, the area of any two points from the centre is the same around the surface of the orbit.

*Excerpt from an AST 100 final exam:
Can such a student really have passed Grade 13?*

N O T I C E

This will be the last issue of the Doings for the summer.

We shall return in September.

Robert 'Murray' Cunningham

On a lovely late spring afternoon in 1941 I was walking home through the village of Richmond Hill when a tall young lad approached and spoke to me. The boy, whose name turned out to be Robert 'Murray' Cunningham, was attending the local high school and was interested in making a telescope. He was a stranger to me, but he knew that I worked at the Observatory. He asked for advice on grinding and polishing a mirror. The elements were readily dispensed, with a suggestion to look into Amateur Telescope Making. On second thought I suggested that the young man speak to Dr. Young, who, as I pointed out, had taught me all I knew about making mirrors. Murray did this and because of his interest in fashioning a telescope, was later to join the staff.

Murray was in his last year at school and was to enter University next term to study medicine. His father was a Presbyterian Minister in one of the village churches. Dr. Young was impressed with the boy and suggested because of his interest in astronomy that he come to the 74" dome on Sunday evenings to receive training in observing. It was Dr. Young's intention to hire Murray as a summer observer and plate measurer.

The boy was competent and enthusiastic. He finished the summer quite successfully and Dr. Young advised Murray that it would be a good thing to postpone going to University for a year. The money earned through a year's full time employment would be of great help in his tuition fees. I feel that because of the inroads on the staff caused by the War, Dr. Young saw in Murray a trained person to help with observing. He knew that replacing the staff leaving for the services would be difficult.

Murray was happy with the arrangement and stayed on. However, sometime in the fall his father was called to another church away from Richmond Hill and the boy was faced with finding a place to live. On the many occasions that he had walked home along the railroad tracks and through the fields he had seen an embankment with a cave dug in its side. He assumed that it had been a place for youngsters to play in the unused field.

With a mixture of canny Scots heritage and Tom Sawyer adventure, he saw in the cave a place to live. With some effort and a lot of carrying on foot, he enlarged the cave, found scrap lumber and built a sod hut. In the village dump he found a little pot-bellied stove and some tile to form a chimney on the sod roof. A bunk was added and a little table. The dump also yielded a door, and light was provided by an oil lantern.

I had grown fond of Murray. He was tall, had dark curly hair and liquid brown eyes. His gentle manner and warm personality were ideal attributes for his chosen profession as a doctor.

On occasion, walking home with him up the tracks and across the fields, I would visit his snug sod hut and chat awhile. He would busy himself lighting the stove and preparing his evening meal. Late in the spring the owner of the property found Murray at home and told him that it was indeed private property and that he must leave.

I learned later that after the situation was explained, Murray finished his term at the Observatory on the condition that when he left, the hut would be torn down and cleared away. The property owner wanted to discourage any future squatters.

He left the Observatory and eventually graduated in Medicine. Sometime later he moved to the Maritimes.

I saw Murray a few years ago when he came to Toronto for a visit and called in at the Observatory. He wanted advice and suggestions for a telescope to be installed in a college where is now active.

To the Northwest of the Observatory on the lower corner of the town, a yellow brick apartment building stands over the spot of Murray's sod hut.

Gerry Longworth

COUNTDOWN FOR THE CFHT

The mechanical parts of the Canada-France-Hawaii telescope are being assembled at La Rochelle, France, an industrial centre on the western coast. An inflated structure was erected for the purpose last fall but what the French contractor calls a "force majeure" caused it to deflate (CFHT Corp. says it was a manufacturer's fault in the fabric). The erection of a new one had to wait for a calm day, and these are few and far between on the European seacoast in winter. As a result there has been a 3 1/2 month delay, although previously the telescope had been, remarkably, essentially on schedule.

The decision to assemble the telescope (except for the mirror) before shipment to Hawaii was a very wise one in view of its complexity. It is necessary to ensure that mechanical, hydraulic, and electrical components all be integrated into a faultless instrument before installation at 13,800 feet. It should be anticipated that adjustments, fault corrections, even design changes will be needed. It is known that some machined surfaces suffered corrosion damage in the salt air. Perhaps the process of assembly, run-in, testing, and disassembly at La Rochelle will take longer than the time originally allowed for, resulting in an accumulated delay of six months. Nevertheless, it is still possible that the telescope can be shipped in the late fall of this year.

Roy Dancey at DAO is keeping a very close watch on the progress of the polishing of the mirror. An astigmatism which developed last year has been eased out, leaving an "orange peel" pattern at the moment. One might say that imperfections of λ of the order of the mirror diameter have been eliminated but those of shorter λ remain to be dealt with. The mirror should be ready when the telescope is.

Perhaps the most interesting development at the recent meeting of the CFHT Board in Hilo was the possibility that the CFHT Headquarters might be located in the cattle town of Waimea. This is at the other end of the Saddle Road and not any farther from Hale Pohaku than Hilo. Advantages are that Waimea is at 3000 feet rather than sea-level, and there is much less rain (20 inches per year rather than 136 inches at Hilo). There is a dandy airport, good (though expensive) schools, and an apparently warm welcome from the citizens of the area. We are giving the proposal very serious consideration. If CFHT goes to Waimea some or all of the other groups with operations on the mountain (the UK infra-red telescope, the NASA infra-red telescope, NRAO's millimetre-wave facility, and UH) will probably go too, forming an integrated activity with joint facilities such as a library, a cafeteria, shops, etc.

It is not possible as yet to formally designate a date on which the construction of the telescope will be complete. A target date for the beginning of use is June, 1979.

Donald A. MacRae

COMINGS AND GOINGS

Dot Fraquelli was in Charlottesville, Virginia, April 4-7, writing a paper with her several co-authors on the subject of HR 1099, an RS CVn binary. Dot was also observing in Chile between April 18 and May 8. Of her 21 nights, 11 were photometric and 6 completely overcast.

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Bob McLaren was at Kitt Peak observing Venus with the 10-micron heterodyne spectrometer from April 15 to May 1.

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Bob Garrison was at UCLA May 2-3, giving a colloquium with the unforgivable title of "The Interstellar Reddening Controversy; Peculiarities There, R Not." He is threatening us with the same talk on his return. Now that he is winding up his sabbatical, Bob writes "Believe it or not, I'm homesick for Toronto and will really be glad to be back." He leaves Lick on June 18 for a long slow trip home by motorcycle.

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Robert Roeder is on the Local Organizing Committee for GR8 - the 8th World Conference on General Relativity and Gravitation to be held at the University of Waterloo August 8-17. He was at the Applied Mathematics Department of that University on March 17 to give a colloquium "Expanding Configurations in General Relativity." On April 21 he was at Yale talking on "Recent Advances in the Theory of White Holes."

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Peter Broughton (B.Sc. 1962) is spending some weeks at the Observatory working on the papers of Dr. Heard.

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Summer students with us this year include Ian Baskerville (working with John Percy), Nebojsa Duric (Seaquist), Wendy Freedman (Percy), Doug Gies (Bolton), Ian Kay (Hogg), Deborah McDonald (Library), John Perkins (Observer's Handbook), and Tom Wells (Coutts-Clement).

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Recent travels and talks by Sidney van den Bergh have been as follows: April 27, ESO, Geneva, "The Magellanic Clouds and the Local Group"; May 4, CTIO, La Serena, "Recent Photometric Investigations of Early-Type Galaxies"; May 5, CTIO, "The ESO Workshop on the Magellanic Clouds"; May 19, Yale, "Musings on Galaxy Classification"; May 25, CASCA, London, "The Space Telescope - Panacea or Boondoggle?"

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1977 H.L. Welsh Lectures

The 1977 series of H.L. Welsh Lectures was held in the Physics Department May 16-18. The two speakers, who delivered three lectures each, were Nobel Prize Winners Felix Bloch and Charles Townes, the latter bringing a strong astronomical flavour to the proceedings with talks on such topics as "Molecules in Interstellar Clouds" and "Infrared Astronomical Spectroscopy".

The talks were mainly under the auspices of the Physics Department, but had strong support from our own Department. At the opening Bob McLaren, on behalf of us all, presented Harry Welsh with a one kilogram piece of the Allende Meteorite (provided by Professor Robert Follinsbee of the University of Alberta specifically for this purpose). In his remarks Bob noted that Harry Welsh has always had strong ties to astronomy: in 1948 Harry and his student Jack Locke had discovered pressure-induced absorption, later used by Herzberg to make the first identification of molecular hydrogen in Jovian planets. Other graduate students of Harry's have included John Galt, Director of the Dominion Radio Astrophysical Observatory, and Harvey Richardson, Acting-Director of the Dominion Astrophysical Observatory. In addition Harry is a past-president of the RASC's Toronto Centre, and in his years as Chairman of the Physics Department always offered firm support to our own Department.

SEMINARS

Seminars in May were as listed in our last issue, except that Sidney van den Bergh's talk was changed from May 17 to May 10, and the title of Dick Henry's seminar was "The Far Ultraviolet Background Radiation." No further seminars are scheduled for the summer.

P O T P O U R R I

There has been a sudden upsurge in our transportation facilities. A Dodge Aspen stationwagon has been bought for ferrying students back and forth between the Department and the Observatory, the Observatory's old van has been replaced by another Ford van, and a Chevette car has been provided for the use of our observers on the mountain at Las Campanas.

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NRC was a little premature in its announcement that Bill Wehlau would be the next chairman of the Associate Committee on Astronomy (reported in our last issue). The new chairman will in fact be Ian Halliday. The first meeting of the new committee was held in London, Ontario, on May 28.

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Gerry Longworth is to be congratulated as a winner of the University's Sesquicentennial Long Service Honour Award for his more than forty years' service to the DDO. A presentation will be made at a reception at the President's home on June 5.

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A letter from Bob Deupree brings news that he has accepted a permanent position at the Los Alamos Scientific Laboratory. He will be with the J-15 group, which should allow some of his time to be devoted to astrophysical research.

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Approval has been given for the painting of the domes on top of the Observatory's Administration Building with white titanium oxide paint. This will greatly reduce the summer heat in the domes, which, with the steady increase in electronic components there, has become more and more unacceptable. The painting should be done in mid- or late-summer.

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MERRY MONTH OF MAY

It's been that time of year again when strong able-bodied instructors are reduced to black despair and bitter wailing when confronted by the results of their year's efforts at teaching. A sample from one exam paper appears on our front cover, and here are a few more choice tidbits. Others will appear in REVISIONIST'S CORNER in future issues.

- *Copernicus was a professor at a noted institute; he was more of a scientist than an astronomer.*
- *Jupiter is a jovial planet.*
- *Quasars emit spectrographs.*
- *The mass of quasars has been determined and found to be very small - about one parsec.*

- *When quasar spectra were examined the lines were shifted to the right about 15°.*
- *A 10 solar mass star loses its energy very quickly since the radiative envelope allows heat and light to escape very easily. A 1 solar mass star, spending a longer time in its evolutionary and developmental stage, has time to develop a protective convective layer for itself. [Submitted by Dave Turner from Laurentian.]*
- *'Graben' is a new kind of breakfast cereal. [From Tom Bolton's third-year solar system course.]*

PAPERS SUBMITTED

S. van den Bergh	Musings on Galaxy Classification
S. van den Bergh & de Roux	The Starfield Surrounding NGC 6528
Mary Lane	The Period of Delta Ceti
C.T. Bolton & S. Shore	An Oblique Rotator Model for the Helium-Rich Stars: The Spectrum Variable Sigma Orionis E
E.R. Seaquist, L. Davis & R.C. Bignell	Spiral and Irregular Galaxies at 2.7 and 8.1 GHz IV: NGC 3079 and NGC 4490

REVISIONIST'S CORNER

John Percy asked his elementary course students to write a short paragraph about the David Dunlap Observatory. Excerpts from two of the answers:

The David Dunlap Observatory stands at the edge of a very high cliff. I think it was situated somewhere around Spain.

The David Dunlap Observatory was donated to the University of Toronto for use by doctoral students and associate professors. [Others need not apply - J.R.P.]

FINAL ITEM

Hubble

Fame, they say, is a fleeting thing. What is interesting about it, though, is the varying rapidity with which it flees. There are those for whom it endures across centuries, while for others, even the living-legend-in-his-own-time sort of people, fame may abandon them at the grave. It is as much a caprice of history as it is a consequence of their work. I often think of Otto Struve in this regard. When I was a graduate student in the States in the mid-fifties, he was revered as an almost godlike figure of infallibility. Scion of a famous astronomical family, author of an endless stream of papers for the Ap.J., his views were sought on all things astronomical. Many a technical argument was clinched by statements beginning "Well Struve finds that....." Today, scarcely a decade after his death, he is forgotten to a degree that most students now are not even sure how to pronounce his name. (A sure-fire way of horrifying Jack Heard was to speak of 'Stroov'.) One for whom Fame was a far less fickle mistress was Edwin Powell Hubble.

The young Hubble, I imagine, was the sort of guy who could easily stir black jealousy in the hearts of his fellow students. Great intellectual prowess was combined with astonishing good looks, commanding physical presence, and outstanding athletic attainments - someone you damn well couldn't beat at anything!

He was born in Marshfield, Missouri, in 1889, but spent much of his early childhood in Kentucky, where his father was a small-town lawyer. Later the father went into the insurance business in Chicago, and here, in high school, Edwin won a scholarship to the University of Chicago. It proved a decisive move, because he there encountered the great George Ellery Hale, who inspired in him a love of astronomy. Hubble graduated with a B.S. in mathematics and astronomy, and was then faced with what must surely have been a unique choice. On the one hand he had won a Rhodes Scholarship to continue his post-graduate education at Oxford. On the other, the 6 foot 2 inch, 200+lbs young man had gained such a reputation as a boxer that a Chicago sports promoter made a serious offer to train him towards contesting the world heavyweight championship.

Although Hubble chose Oxford, he never lost interest in athletics. He, of course, won an Oxford blue in boxing, and while in Europe fought an exhibition match against Georges Carpentier, the world light-heavyweight champion. He won a second blue in track and field, and a third in rowing. Not all his sports interests were that strenuous, however, for he also developed a great interest in dry-fly fishing, and in later life gained a high reputation in that field. All in all, he thoroughly enjoyed life in England, adopting the English academic's tweedy-look and pipe-smoking habits, and ever after maintaining Oxford slang and a touch of Oxford accent in his speech - something that forever irritated a fellow-Missourian, Harlow Shapley.

Academically, though, he now turned from science. Having looked at typical final exam papers in Oxford's mathematics, he decided to take a degree in law instead. This was accomplished in 1912, and there followed a year of practising law back in Kentucky. It was enough to convince Hubble that he had made a mistake, for by 1914 he was enrolled as a graduate student at the University of Chicago's Yerkes Observatory. He developed a thesis on the classification of nebulae that so impressed Hale, now at Mt. Wilson, that on the day Hubble received his Ph.D. in 1917, Hale telegraphed him an offer of a staff position at Mt. Wilson. The reply was immediate: "Regret cannot accept your invitation. Am off to war."

There is a photograph of Hubble at this point in his life, standing in paradeground poise showing immense pride in his uniform, alongside his sister in a nurse's uniform. So it was back to Europe, but this time to the horrors of trench warfare in France. Hubble rose to the rank of major, and was also wounded in the war.

But Hale's offer remained open, and with the war over, Hubble moved out to start his life's work in California. His fame there, of course, would steadily rise, and Hollywood was delighted to find that brilliant scientists could also be astonishingly handsome. Hubble was frequently called upon to pose for pictures with the film stars of the day, and doubtless more than one male star must have wondered if he was doing the right thing. There is a picture of Hubble with Raymond Navarro that is not at all to Navarro's advantage!

Fame was to come through a continuation of Hubble's work on nebulae. In the early twenties astronomy was in an uproar over the true nature of the spiral nebulae. On the one hand there was considerable evidence to suggest that they are individual Milky Way systems, and that the universe therefore is immensely bigger than had ever been thought previously. On the other hand, there seemed to be evidence also that they are much smaller systems belonging to our own galaxy. The evidence had been debated endlessly, but without resolution. Now it would be Hubble who would make the crucial observations that settled the argument in favour of the individual galaxy theory. This he did in 1923, yet it would not be until New Years Day of 1925 that an official announcement was made.

The reason for the delay was straightforward. Just down the hall from Hubble's office was the office of Adriaan van Maanen, who was not only considerably senior to Hubble, but who just happened to hold the major evidence favouring the contrary theory. Publication of Hubble's new work would be almost tantamount to calling van Maanen's evidence a fabrication. (van Maanen's work has never been satisfactorily explained.) The diffident Hubble delayed.

News of Hubble's results began to leak out to a few top American astronomers, much to their excitement, and there was even a brief report published in the *New York Times* in November of 1924. Finally, matters reached a head at the AAAS meeting in late-December of that year. Although Hubble was not present, his friends Joel Stebbins and Henry Norris Russell were, and made up their minds that Hubble's results should be presented - particularly since there was to be a \$1000 prize awarded the best paper at the meeting. Stebbins later wrote to Hubble:

On the first evening of the meeting, I happened to take dinner with Russell who had arrived rather late, and one of the first things that he enquired about was whether you had sent any contribution. On my answering no, he then said, "Well, he is an ass. With a perfectly good thousand dollars available he refuses to take it." These remarks led to some discussion, and afterwards in a group in the hotel lobby we drafted a telegram urging you to send by night letter the principal results which Russell and Shapley could make up into a paper. After this message was drafted, Russell and I started to go over to the telegraph office to send it, but on the way we stopped at the desk and put it on a regular blank. Just as we were leaving, Russell's eye caught beyond him on the floor a large envelope addressed to himself, and at the same time I spied your name in the upper left corner. The clerk gave us the material, and we walked back to the group in the lobby saying that we had got quick service, and that the paper was on hand.

At the close of the meeting, the Council of the Society elected your paper as the one to be recommended for the prize....

It was Russell who read the paper on Hubble's behalf on January 1, 1925. As Allan Sandage later put it, an era of enlightenment in cosmology had begun.

Hubble would go on to even greater work: the classification of galaxies, and the discovery of the universe's expansion - the first useful data on which to base theoretical cosmology.

Perhaps ironically in one of such athletic attainments, it was a heart ailment that brought Hubble's life to a close. He died suddenly of a coronary thrombosis in September, 1953, while preparing for a four night run at Palomar. If fame has not deserted his name, it is not least because he deserved it. Nick Mayall said of him: It is tempting to think that Hubble may have been to the observable region of the universe what the Herschels were to the Milky Way, and what Galileo was to the solar system.

J.D.F.

