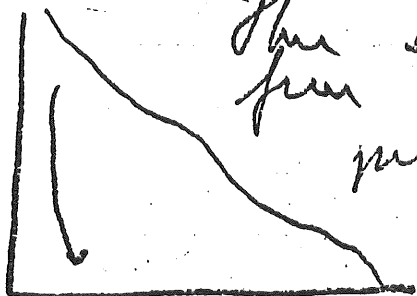


DAVID DUNLAP DOINGS

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The above notes on determination
 from the accuracy of the observed
 parallax. The luminosity
 is a direct measure of the mass. The
 is the same for the rate.
 so the mass depends on luminosity

An A100 student's description (in its entirety)
 of how stellar masses are determined. The vertical
 slashes are due to the examiner's spasmodic twitching.
 See 'Merry Month of May' on p. 5.

GUEST EDITORIAL

DOES THE PH.D. THESIS BUSINESS NEED OVERHAUL?

As time has brought a steady flow of Ph.D. thesis supervising, appraising, and examining my way, I have come to have a growing feeling that the whole game could stand a long hard look. Does the Ph.D. thesis, inherited from a long-distant past, fulfill the needs of today, or are we simply chugging along on the rails of an archaic tradition?

Without pretending to have made a careful study of the matter, I have always understood that a hundred or more years ago one was considered to have completed one's formal education with the Master's degree. Hence the very title. The MA indicated that one had learnt pretty much all there was to know of that particular subject, and one then went out and settled into a career. If this allowed total absorption in the same field, you would likely specialize and begin to do research. Now not only would you be a master of the subject, that is have learnt what was already known about the subject, but have begun to add to that knowledge yourself. Years might go by while one carefully built up an intensive piece of research, which with due maturity would eventually be submitted to a university as a doctoral thesis. If you could defend your work against the recognized experts and show you had made a significant contribution to the knowledge of the subject, you were admitted as a doctor, which is a practitioner and teacher of one's art. Not only did you know the subject, you added to it.

Time has changed all that. Partly through a German tradition towards doctorates, Germany being the country to look to in many academic fields around the turn of the century, North American universities came to require a Ph.D. as a prerequisite for their faculty. And with that it soon became obvious that one was better off getting a Ph.D. as soon as possible, in fact while still a formal student. It was no longer the degree of the seasoned performer, but of the neophyte.

I am certainly not arguing for a return to the past. What I question is this retention of the old idea of the Ph.D. thesis as being a singular, massive piece of research taking years to accomplish. Certainly the Ph.D. must remain a research degree, but do we have to do it in a nineteenth century manner?

I have several beefs against the Ph.D. thesis as we know it. As a supervisor suggesting the topic of a thesis, I understand it must represent a 'substantial' contribution to knowledge. Somehow this is always interpreted as meaning that it must take at least a couple of years to complete. But research is advancing at such a rate today that any really interesting question

that is going to take two or three years to answer will quite likely be irrelevant by the time it's done. It may be quite obvious to a supervisor that the next important step in his field can be accomplished with a relatively small amount of observation and analysis, but that work, vital though it may be, will be excluded as a thesis on the grounds of insufficient quantity.

On the other hand, the supervisor had better be pretty sure that he has chosen a 'safe' subject. He himself might well launch forth on some avenue of research which, after considerable effort, may turn out to be a blind alley. Too bad, but on to something else. For the Ph.D. student, however, with time-limited financial support, etc., this could be disastrous. His supervisor must be sure that the thesis, while taking a solid length of time, will eventually prove tractable.

Not surprisingly, this middle-of-the-road policy is sometimes only partly successful. After a lot of effort it may turn out that the thesis problem is rather a trivial one after all. Can the student really be forced to go back to square one and start all over again? In theory yes, in practice rarely. Instead, without being intentionally dishonest, there is a significant padding of the thesis with excruciating details of observing techniques, reduction procedures, computer programs. Or it may become clear that it would really take much more effort than the student can afford to do justice to the subject. Again, partial solutions tend to be padded out with largely irrelevant details and that all too familiar phrase 'Further observations will be necessary...'

These difficulties and uncertainties build up pressures on the student. He is committed to a single make-or-break project of several years duration; his whole career hangs on it, while today his worries are aggravated by simultaneously searching for a job.

What it comes down to is that many a thesis, although certainly not all, is no more than a mildly interesting piece of research, the guts of which could probably have been done in much less detail and time, but which has been blown up out of reasonable proportion to look like something which it isn't. We are encouraging our students to be prolix just when they must go out to face editorial demands for brevity.

Those of us who are habitués of thesis exams are all too familiar with the appraiser's report which clearly isn't all that enthralled by the thesis, but which, because it would be clearly unthinkable to sink any but the most hopeless case at this stage of the game, always somehow manages to end with that magical phrase about recommending that 'this thesis be accepted in part fulfilment....' The fact is that we have tried to retain the nineteenth century thesis in a twentieth century setting. We remain locked in an inflexible system where rigid rules confront the ruinous pressures of modern life. Must we jeopardize a student's hard-won job opportunity for some minor infraction of the rule book? Yet to suggest revision is to call for a whole new thesis exam, so

we canvass examiners beforehand, often accept what we would prefer to see improved, and reduce the exam pretty much to a rubber-stamp.

Personally, I would like to see the monolithic thesis replaced by some kind of requirement whereby the student must publish a certain number of average-length papers, say three or four, in journals of acceptable standing. Possibly the papers to be done with different supervisors. That way the student would be much better trained for the sort of research he will be doing in his post-doctoral years, and the business of selecting 'safe' (and consequently sometimes pretty stolid) topics, the pressures of a three-year all-the-eggs-in-one-basket project, would be done away with.

Iconoclastic and doctrinaire I know; worse, perhaps only academic. Not only would one have to convince all other astronomy departments of the acceptability of this, one would face the formidable task of convincing one's own Graduate School. Nevertheless, I can't escape the feeling that the revolution in undergraduate affairs that we have seen in recent years must sooner or later extend up to the doctorate as well. Perhaps the twentieth century thesis will finally be a child of the twenty-first century.

Don Fernie

COMINGS AND GOINGS

Editor Jack Heard is spending several weeks in Poland and Czechoslovakia, attending the presentation of the Canadian spectrograph to the Observatory of the Nicholas Copernicus University in Torun, and conferring with spectroscopic observers at the Ondrejov Observatory in Czechoslovakia. Mrs. Heard is accompanying him.

René Racine visited Cal Tech and observed with the 200-inch telescope on April 25-28, working with Bev Oke on a joint project of spectrophotometry of the globular clusters in M87.

On May 2 he was interviewed by Toronto's French-language station CJBC on the current status of the CFHT project.

René will be attending an ESO/SRC Symposium on the uses of large telescopes in Geneva May 27-31.

Sidney van den Bergh gave a talk on supernovae at Indiana University April 29, and was in Tucson May 10-15 for telescope scheduling committee meetings which included the first scheduling of the Mayall 4-metre telescope for visitors. He was teaching at the Erice Summer School in Italy May 20-31, with a brief look-in at the ESO/SRC Symposium on May 27 for a lecture on 'Large Telescope Observations of Nearby Galaxies'.

Don and Betty MacRae are enjoying a short visit to Europe May 17 to June 3, with Don attending meetings of the CFHT interim Board in France and also the ESO/SRC Symposium in Geneva.

SEMINARS

MAY Seminars were as announced in the April DDD, with the addition of "May 2nd, Dr. C.V. Vishveshwara of Boston University, - 'The Elusive Black Hole' .

JUNE With the coming of summer and the June Institute, the only seminar scheduled for June is on TUESDAY, JUNE 25th , 16:00 at DDO

Gretchen Hagen and Bob Deupree, "The Effect of Varying Heavy Element Abundance on the Evolution of Intermediate Mass Stars"

Dr. J. F. Heard, "J. Miller Barr and the Barr Effect"

PAPERS SUBMITTED IN MAY

S. van den Bergh "Differences Between Galaxies"

Wm. Herbst "NGC 6193: An Emission Region with a High Ratio of Total to Selective Extinction?"

H.N. Ross "The High Frequency Radio Spectra of Secondary Standard & E. Seaquist Sources".

THE MERRY MONTH OF MAY

May is the month when even the most hardened of instructors, confronted by the results of their year's teaching endeavours, are liable to break down and pound both fists on the desk. Probably DDD should run an annual competition in its May issue for the best howlers from among the Department's numerous elementary courses. Here, for a start, are a few that have come my way:

The trouble with reflectors is that their mirrors get rusty and have to be repainted....

Baade went out from the earth in all directions and looked at RR Lyrae stars. He found the earth is to the west of the Galaxy....

Canadian astronomers were among the first to prove that the Galaxy rotates by noting that different constellations are visible at different times of year....

Johannes Kepler is most famous for his discovery of the General Theory of Relativity....

Quasars are not evenly spaced through the solar system, as the Steady State Theory insists....

The size of our galaxy took a long, long time to find, but fortunately there is plenty of interstellar dust, so radio astronomers finally proved that it is 3 pc across.....

The average density of the universe being 10^{31} km/sec....

The Big-Bang Theory states that we come from a planetary nebula, and there is much support for this view from the modern positions of planets and Hubble's Law....

The best way for choosing between various cosmological models will be to try and find life elsewhere in the universe and see if they can tell us....

But then you don't have to be an A100 student to qualify. Noted on page 139 of MNRAS, 167, 1974: The number of RR Lyrae stars was taken from Hogg and Sawyer's (1963) catalogue....

J.D.F.

P O T P O U R R I

Another Chairmanship

Helen Hogg has been elected chairman (that's Helen's word, not mine, you Women's Libbers) of the Social and Environmental Affairs Committee of the Board of Bell Canada.

Helen also gave a talk to the Huntsman Royal Lunch Club in Hart House, May 3, on 'Extraterrestrial Civilizations'.

Operation Bedpan

Serge Pineault and Jurg Pfund carried the torch for the Observatory in Operation Bedpan, a walkathon on April 27 organized and operated by the Canadian Progress Club's York Central Branch in aid of the York Central Hospital Expansion Fund. They walked the full 15 miles in the near-record time of about four hours.

Staff and students were generous in their pledges for Serge and Jurg, and a total of \$164.10 was turned over to the Progress Club for the Hospital.

Following the walk about thirty staff and students gathered at the Heard's for a victory party in honour of the Observatory walkers.

Runathon

Lee Garrison, Bob's son, entered Toronto's annual Miles for Millions walkathon, and *ran* the 27 miles in five hours, accompanied by a friend on a unicycle.

Elected

Sidney van den Bergh was elected recently to the Graduate Council of the School of Graduate Studies, U. of T.

Ex-Student in Israel

A letter from Mike Shara brings word that he and Honey are enjoying life among 'the palm trees and sub-tropical plants in the ever-present sunshine' of Tel-Aviv. They are looking forward to the arrival of their first offspring in late-August. Mike's research at the university (which will have 30,000 full-time students by 1978) is going well under the supervision of Giora Shaviv. Shalom to you both.

DDD Gambles & Loses

Barry and Kathy Madore have pointed out that in last month's DDD write-up on GASA's Monte Carlo Night they were given undue credit for the organization and success of the event. The idea and much of the preparation were due to Dave Hanes and Roslyn Shemilt, who, as Barry hastens to point out, are the ones to chase after for a repeat performance. Our apologies for the oversight, Dave and Roslyn.

PDF Leaving

Frank Ahern has accepted an NRC Government Lab post-doctoral fellowship at the Canada Centre for Remote Sensing, Department of Energy, Mines and Natural Resources, from September 1. He will be working there with Dave Goodenough (Ph.D. 1969).

FINAL ITEM

Ben Gould, Jack Heard, Tough Times

History does not explicitly record whether Benjamin Apthorp Gould ever gave voice to the expression 'What do you have to do to win?', but I'd bet that he did. If you look at his portraits from a hundred years ago you find him staring sternly forward, grim, determined, bald and bearded, a sort of puritannical Bob Garrison (if such be imaginable). Whether this forbidding demeanour was a result of life's knocks, or whether it merely suited his New England character is hard to say. Certainly he tended to treat astronomy as a contact sport, running with his head down against most of the opposition.

In 1844 the twenty-year-old Gould left Boston to acquire his astronomical training in Europe, obtaining his doctorate at Göttingen under Gauss. His friendship with many of the European greats (Airy, Arago, Encke, Bessel, etc. etc.) stood him in good stead in later years.

Returning to the U.S. Gould soon made the first of his important contributions to American astronomy, the founding of the *Astronomical Journal* in 1849. In 1858, after some vague but apparently curious goings-on, Gould was appointed director of the newly formed Dudley Observatory in Albany, New York. He immediately ran head-on into the observatory's trustees, and as the *Dictionary of Scientific Biography* tells it: "Matters came to a head in a vicious newspaper campaign, in which Gould was charged with being incompetent, disloyal, and arrogant. The trustees resolved to remove him from the directorship.... But the director ... had much invested in the observatory and refused to abandon it. Finally, on 3 January 1859, Gould was forcibly driven from his home by a band of toughs hired by the trustees, several of his papers being destroyed in the process."

The trustees had been supporting the *Astronomical Journal*, and what with their attitude and the coming of the American Civil War, the *Journal* unhappily languished. Gould was not able to re-establish it for a quarter of a century.

Soon after Gould's retreat from Albany W.C. Bond of the Harvard College Observatory died, and Gould next saw himself as the director of that institution. There was an acrimonious and highly unpleasant exchange involving a number of like-minded individuals, and in the end the directorship went to Bond's son.

Gould stepped out of astronomy temporarily during the civil war, and joined the U.S. Sanitary Commission. Here he "conducted a long series of measurements on the heights, ages, and peculiarities of the soldiers and his work has become an interesting book of reference."

After the war Gould gave up the search for fulfilment in the Sanitary Commission and came back to astronomy. He now had two burning ambitions. He had become fascinated by the new science of photography, which he wanted to apply to astrometric problems. At the same time he realized the need for astrometric work in the southern hemisphere, so what better than to go to South America to do both.

Negotiations with President Domingo Sarmiento of the Argentine led to Gould arriving at Cordoba in 1870 to establish the Argentine National Observatory. Formal establishment was one thing, getting down to practical work was another. There was a long delay while instruments and accessories were shipped down from the States, but Gould was not one to sit idle: equipped with no more than a pair of binoculars he set to work to study the southern skies. One may smile at the thought of the professional astronomer limited to binoculars, but it was specifically these that enabled Gould to discover that curious distribution of bright southern B-stars ever since known as Gould's Belt. Not every delay is a disaster.

After some two years the major equipment began to arrive, in particular a 13-inch photographic objective lens that Gould had been eagerly looking forward to as his main workhorse. Trouble was never far behind Gould though, as he found when he came to uncrate the lens: "My hearers already know the terrible disappointment which awaited me: - I found the flint glass of the lens completely broken into two nearly equal parts. How or when this happened I know not ... [for it] had been brought by hand, like a chronometer, in a box especially made for the purpose. Lamentations being useless I did the best I could, [but] attempts at cementing the fragments with the needful precision proved fruitless.... I took steps to secure another photographic object-glass, calling upon my mother for the means of defraying the necessary expenses." (Modern observatory directors, in your financial despair, take note.)

Next it was Gould's photographer that caused trouble. They were still using wet collodion plates in those days, and the preparation of these required considerable skill. Gould had hired a highly trained photographer in the States for this purpose, but this individual, perhaps bored by all the delays, now was found to have used up all the supplies in making pretty picture cards which "I grieve to say" said Gould "were disposed of for his personal advantage and emolument."

Back in the States to replenish supplies, Gould hired a new photographer, a Mr. John A. Heard. Jack Heard, as one would expect, proved to be an absolute paragon of virtue and a "skilful manipulator" to boot. Together Gould and Heard began the long-awaited and extensive photography of the southern heavens, but even a Heard could not withstand Gould's luck, and a breakdown in health forced Heard to return to the United States after only a short stay in Cordoba.

But Gould had got the start he needed, and now he was well into those enormous survey programs that were to bring him his greatest recognition, the Uranometria Argentina, a zone catalogue of over 73,000 stars, the Cordoba Durchmusterung, and so forth. After fifteen years in the Argentine he retired to the United States to continue his reduction of the observations, on which he was still working when, unlucky to the end, an accident suddenly ended his life in 1896. He had had a stormy and at times controversial career, but, as his obituaries noted, he was one of the early few that set American astronomy on the road to greatness.

