THE EARLY HISTORY OF ASTRONOMY AT QUEEN'S UNIVERSITY

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"The grand lesson of astronomy is that man's true dignity does not consist in the mere outward and physical. The more that discoveries of astronomy make this world shrink into insignificance, the more amazing is the view of man's spiritual dignity." Rev. William Leitch, D.D., Principal of Queen's University, 1860-1864.

The beginnings of Astronomy at Queen's University

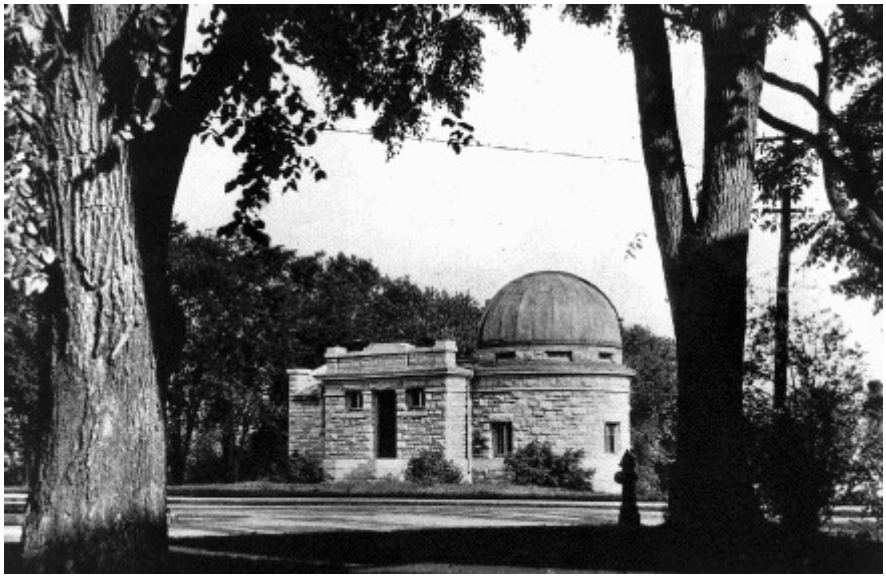


Figure 1. The old observatory, circa 1860.

Astronomy is the oldest of the sciences and has influenced most of the advances in Physics. Originally it was thought that the positions, motions and observed events might influence human lives, but it also developed a more practical aspect. In particular, on the North American continent peoples from various European countries settled the land, and it was important to demarcate areas. Because the areas were large, the obvious way was by determining latitude and longitude. In addition the knowledge of the position of ships at sea was of extreme importance, and again, this was determined from latitude and longitude by observing celestial objects, and combining these with knowledge of time. Both required the accurate positioning of celestial objects, determined at Observatories, and for convenience in the early days, they included also magnetic data for compass calibration, and meteorological observations.

Thus, because of its interests, the British Ordnance Department initiated the construction of a series of observing stations at various points throughout the British Empire, and in 1840 the first instruments for an observatory arrived in Canada. It was the duty of a Royal Artillery Detachment to establish a temporary meteorological observatory in Toronto to investigate "Terrestrial Magnetism and Meteorology". Ten years later a meteorological station was built on the Citadel at Quebec, a co-operative effort of the Canadian and Imperial Governments, with Canada providing part of the money. The first astronomical observatory in Ontario was set up in Kingston, but it is clear that the real growth in astronomy in Canada owes its origin to the problems associated with recording weather patterns, fixing of meridians and surveying, rather than conventional astronomy.

The chief centre of meteorological, geodetic and astronomical information in Kingston was at the old Observation Station, the headquarters of which had been in the Commandant's House on North Street. For the most part, Commanding officers were most co-operative in encouraging the sharing of scientific information with the community, and retired military and naval personnel who had settled in Kingston were a natural nucleus for scientific ponderings.

To add to the core of military and naval knowledge, civilian contributions were solicited, and these tended to be more astronomical in nature, as can be seen from the following letter from Dr. James Williamson, first professor of Mathematics and Natural Philosophy (Physics) at Queen's College and who served the College from 1842 to 1895. He wrote to the *Chronicle and Gazette*:

20 May 1845. *Sir, With a view to ascertaining the results of similar observations made in Canada or other parts of America, allow me at present to state that the termination of the eclipse of the sun on the morning of the 6th of this month, took place in Kingston at 5 hr, 2 min, 11 sec.*

Dr. Williamson's association with Her Majesty's Forces continued long after their strength was reduced at the Kingston Base, but in 1855, with funds provided by some generous citizens whose interests had been aroused by the solar eclipse, and by the Corporation of the City, a building known as Kingston Observatory was erected in what is now City Park.

The new Principal of Queen's, Rev. William Leitch, who had been appointed in June 1860, and Rev. James Williamson, were equally interested in astronomy and desirous of determining the exact longitude of Kingston, and devoted much time to the Observatory. The equipment included an Alvin Clarke equatorial with a 6[1/4]-inch objective lens, a Short reflecting telescope with a 7[1/2]-inch speculum mirror and a small refractor. A Beaufroy Transit was lent by the Royal Astronomical Society of London and arrived during the session 1863. The following announcement appeared in the university calendar for that year:

Ä course of not less than six lectures in astronomy, open to the public, is delivered each year in the City Hall and the observatory".

The running of the observatory was in the hands of Gentlemen Amateurs, but it appears that only about half of the City Council approved of the observatory. There were objections to the very large sums of money expended on "paths and trees in an apology for a park and on the observatory erected, which no one knows anything about except a professor and one or two students of Queen's College". After five years of operation an annual grant of $500 was awarded the City by the province, one condition being the appointment of a qualified observer, and Queen's College offered to manage and develop the facilities without cost to the City.

Such was the enthusiasm at Queen's for running the Observatory, that an agreement was signed on 19 January 1861 transferring the Observatory to the College, together with one acre of the park. The sum involved was $1, but the city fathers required a number of civic services to be performed, including arrangements for the weekly corrections to the City Hall clock, publishing twice daily barometric and thermal readings, giving six public lectures each year, and holding a weekly open house. In addition, "the Mayor, members of City Council and their successors have the privilege of using the telescope, at proper and reasonable times, under the direction of the observer, without charge, and other visitors being respectable citizens may be charged not more than two cents for the privilege". This clearly led to some irritation to both parties, and there were also difficulties in upgrading the observatory from amateur status. There was also the question of debt to the College. But chiefly acts of vandalism contributed to the removal of the Observatory in 1881 to a new site on Queen's Campus, to a building which cost the princely sum of $639. It was from this site that measurements were made on the transit of Venus across the Sun in 1982 December 6, as a means to determine the Astronomical Unit. In 1899 astronomy came under the control of Professor Dupuis in the Department of Mathematics and it remained in that Department until about 1963. About 1906 the instruments were moved to the foot of University Avenue and mounted in a small but impressive limestone observatory purchased by Mr. Justice Maclennan, chairman of the Board of Trustees, and presented by him to Queen's University. This in turn was demolished in 1946 to make way for McLaughlin Hall.

The start of Astronomy teaching at Queen's

In the university calendar for 1891-92 an insert at the page listing the courses in physics under the direction of Professor Marshall, reads:

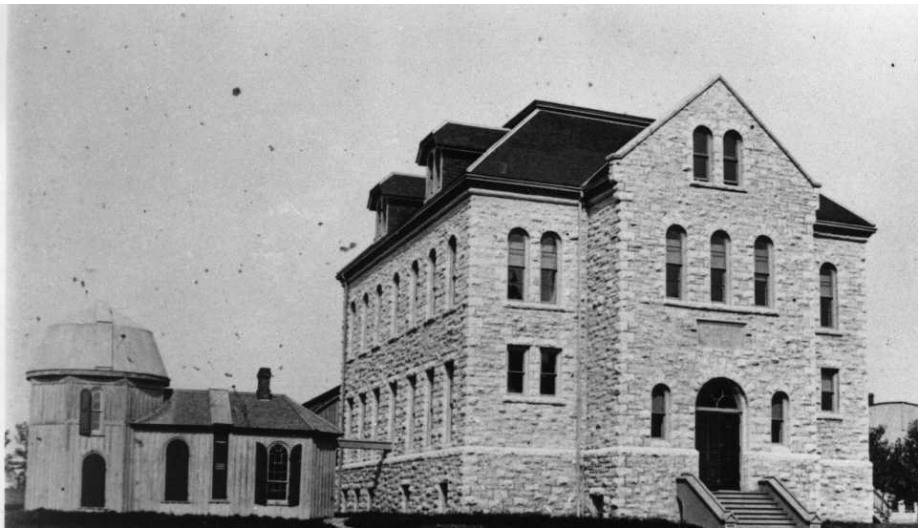
"Fortnightly lectures and examinations on Astronomy by the Professor of Astronomy are to be attended by all students in the Junior Class in the Department of Physics."

A student of that year recalls that the professor was James Williamson, then 50 years on the Queen's staff and in the eyes of the students very old, very absent minded, but highly revered. The lectures were given in a small frame building in the rear of the present Carruthers Hall. A stove provided inadequate heat, but the professor wore two overcoats and one muffler about his neck and one around his waist! One of his students, S. A. Mitchell took his M.A. in 1894, became a professional astronomer, and in later years was widely known in his position as the Director of Leander McCormick Observatory in Virginia, U.S.A.

For several sessions beginning with 1899-1900 a course was given on Spherical Trigonometry, Geodesy and Astronomy by Professor Dupuis. In 1907 it became Spherical Trigonometry and Astronomy. In 1912 Theoretical and Practical Astronomy was substituted with Professor D. Buchanan in charge. He offered two courses in his last year at Queen's, 1920-21, Descriptive Astronomy and a one-term course in Spherical Trigonometry and Astronomy. The following year Professor K. P. Johnston was appointed to the teaching staff in mathematics and until his retirement in 1946 he gave these courses with enthusiasm every winter and most summer sessions.

In the autumn of 1939 Professor A. Vibert Douglass, who had been a student of Eddington, joined the staff as Dean of Women after seventeen years of lecturing in astronomy and astrophysics at McGill University, with research work in the fields of spectroscopic absolute magnitudes, the atmospheres of pulsating stars and high temperature stars showing Stark effect. In the summer of 1940 and on subsequent occasions she was invited to give Professor Johnston's courses. In 1946 the Department of Mathematics decided to drop the half course in Spherical Trigonometry and Astronomy, and she became acting Professor of Astronomy. Thereafter the course entitled Descriptive Astronomy became An Introduction to Astronomy and Astrophysics, given every winter and at least every second summer.

In 1950 Professor Douglass offered a more advanced course for graduate students who were working towards the Master's degree or the Ph.D. in mathematics or physics. In her spare time she was able to write a biography of Eddington.



As we have mentioned, the Observatory at the foot of University Avenue was used by undergraduates in astronomy, but was demolished in 1946 to make way for the new Mechanical Engineering building, McLaughlin Hall. When plans for a new Civil Engineering building were being discussed, it was agreed to erect a new observatory on its the roof, and to install a new 15 1/4 inch reflecting telescope. The original Alvin Clarke telescope and the other remaining instruments were put into storage,

but are now on display in the foyer or Stirling Hall.

Figure 2. The Carruthers observatory

The intervening years

In 1955, Dr. George Harrower became a member of the Department of Physics, and with a background of electronics and with radio Astronomy at the Defense Research Board, he proceeded to establish radio astronomy at Queen's. A ten acre site was leased near to Kingston, and attempts were made to erect a radio synthesis telescope. This did provide training for a number of graduate students, but the severity of the winter meant that remedial work had to be carried out each spring. He also carried out research on the scintillation of radio stars, which are produced by moving irregularities in the ionosphere. This was important at that time, and was widely pursued while the Science of Radio Astronomy was awaiting the construction and general availability of the large sythesis telescopes that are now used. In addition, solar measurements were made on a radio spectrograph.

Plans for the optical observatory on the roof of the Civil Engineering building called for a dome room, two offices, two rooms for the use of graduate students, a seminar room, a work room and a dark room. Attachments for spectrographic and for photo electric work would provide simple research possibilities. The approval of a grant of $25,000 to Queen's University enabled the purchase and installation of the optical telescopes in the dome room. In addition, a small planetarium was purchased as an aid to demonstrating celestial motions to both students and visitors.

Under George Harrower, a cross faculty Radio Astronomy Group was formed, consisting of Harrower (Physics), Bob Chisholm (Electrical Engineering) and and Vibert Douglas and Jack Hogarth (Mathematics). This covered the fields of Physics and Astrophysics, the technology of antenna arrays, and cosmology. Frequent meeting were held to discuss and co-ordinate future work.

Astronomy was strengthened in the Department of Physics by the setting up of a separate budget to cover the cost of a secretary, supplies, and the acquisition of astronomy books and journals which at that time were scarce in the Department. The astronomers were accommodated in the newly constructed rooms under the telescope dome.

With the advent of the opening of Stirling Hall in February 1964, the group was moved there, to be integrated into the Department of Physics.

The writer arrived at Queen's in September of 1963, and when in 1964 George Harrower was appointed Dean of the Faculty of Arts and Science, was asked to take over the Group. Also in 1963, Professor Douglas decided to take a well earned and delayed retirement. In 1964 graduate Courses were given in Radio Astronomy and Advanced Radio Astronomy, and in 1965 Dick Henriksen, who had completed his Doctorate at Manchester in Theoretical Astrophysics, joined the Group, followed the next year by Alan Bridle from Cambridge, and later by Mike Kesteven from Sydney, Australia.

The commissioning of the 45-metre diameter radio telescope of the Algonquin Radio Observatory enabled a more extensive research program on radio flare stars, star formation and the interstellar medium and in fact, the first scientific paper on results from the ARO were published from the Group. The arrival in 1969 of W-Y. Chau strengthened the theoretical side, and the unofficial name was changed to "The Astronomy Group".

There were changes in faculty with the departure of Alan Bridle who joined the National Radio Astronomy Observatory at Charlottesville, Mike Kesteven who now heads the Australian National Observatory, and the departure of W-Y Chau, now tragically deceased, who assumed the position of Deputy President of a Hong Kong University. Members who have joined faculty since that time include Kayll Lake (General Relativity), Dave Hanes (Optical Astronomy), Martin Duncan (Theoretical Astrophysics), Judith Irwin (Radio Astronomy) and Larry Widrow (Theoretical Astrophysics).

The graduate course structure has been widened to include aspects of interest to members of the Group with the inclusion of courses in fluid dynamics and relativity in addition to the more classical Astronomy, and the undergraduate offerings were increased to provide a specialization in Astronomy. However, unlike other Universities that try to follow the trend, the Department name has never been changed to "Physics and Astronomy", although there are signs of a trend in this direction.

Resources

As with most Astronomy Groups, there are now no facilities maintained on Campus, apart from local computers, which are tied into the network, and an upgraded optical telescope to replace the old one, which is used chiefly at the undergraduare level and for public demonstrations. The 45-metre radio telescope, operated by the National Research Council, has been decommissioned, but other radio facilities are used, including the Very Large Array of the National Radio Astronomy Observatory, the James Clerk Maxwell mm-wave telescope in Hawaii, cooperation with the Galactic Plane Survey carried out in Penticton, B.C. and the Giant Metre-wave Radio Telescope at Pene, India. Optical observations are made using the Canada France Hawaii Telescope, the Hubble Space telescope and the Anglo-Australian telescope in Australia. Close contact is maintained with the Canadian Institute for Theoretical Astronomy in Toronto.

It is anticipated that interests in Astronomy and Astrophysics will grow, as evidenced by the number of graduate students which now number 15, with numerous Post Doctoral Fellows and Visitors. But the shape of the Department of Physics is changing with the coming on line of the Sudbury Neutrino Observatory and the melding with neutrino astronomy which promises an extremely interesting and scientifically prosperous era.

Other Sources of Information

- Queen's University Astronomy Research Group: www.Astro.QueensU.ca

- Department of Physics: www.Physics.QueensU.ca
- M. Cohoe, "The Observatory in City Park 1855-1880": Report in the Queen's Archives.
- A. Vibert Douglas, Ästronomy at Queen's University", 1956, JRASC, 52, 82
- V. A. Hughes, "The Kingston Observatory", 1986, 180, 124
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