

THE ROYAL ASTRONOMICAL SOCIETY OF CANADA



SASKATOON CENTRE

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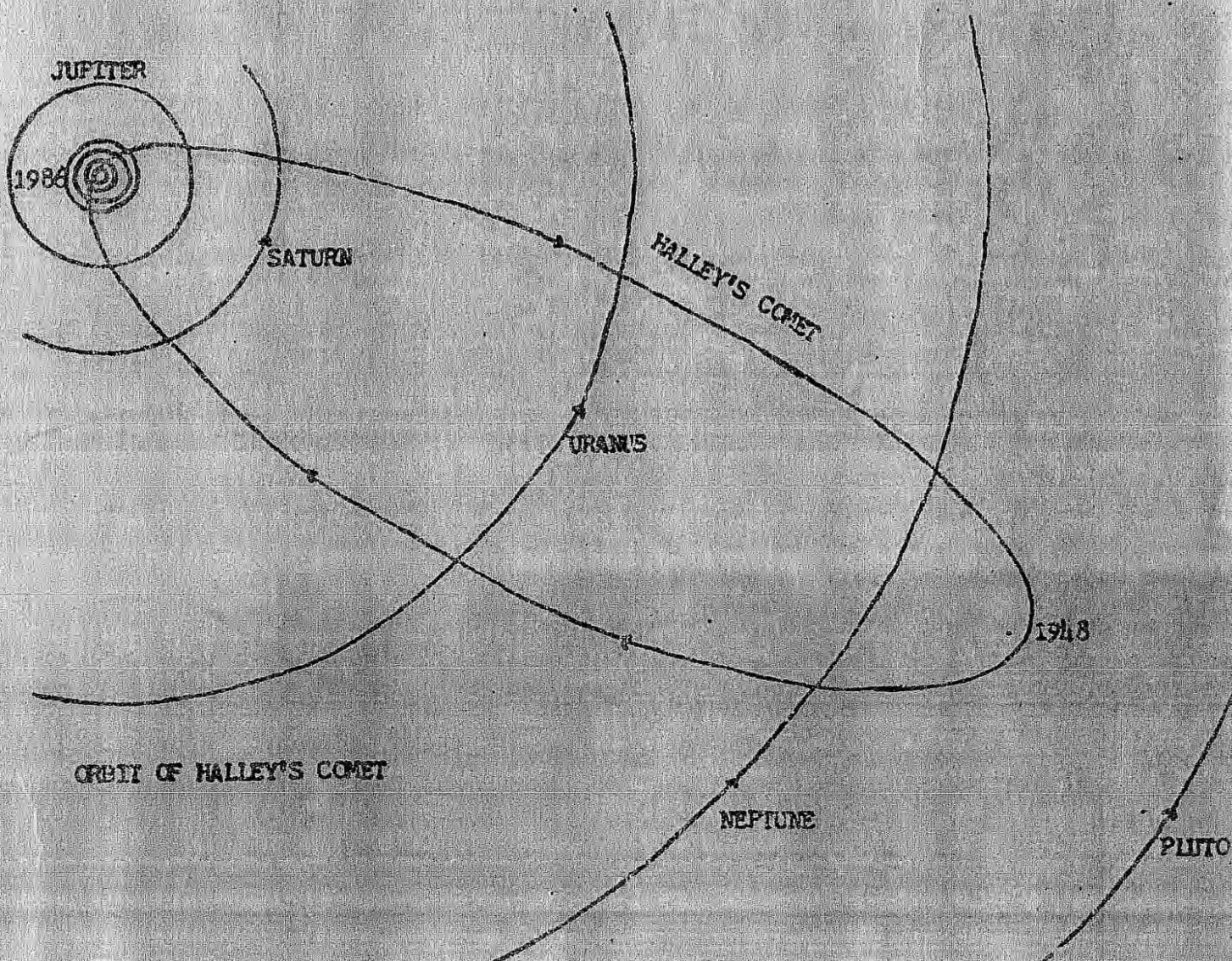
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# NEWSLETTER



## THE ALL PURPOSE HALLEY

from "Cassiopeia" (Canadian Astronomical Society)

Edmond Halley was one of those rare creatures who could make commendable progress in almost any field of science. In fact, so remarkable were his scientific achievements, both in astronomy as well as in other fields, that he was widely hailed as one of THE outstanding scientists of his day. (Astronomers were evidently held in higher esteem by governments in those days; Galileo and his lifelong government pension for his development of the telescope for military purposes comes to mind also.)

First, a quick look at Halley's astronomical prowess, which was impressive to say the least. His love of astronomy began early, as seen from the preface of his Catalogue of the Southern Stars: ". . . from my tenderest youth I gave myself over to the consideration of Astronomy . . ." In 1673, at the age of seventeen, he began to study at Queen's College, Oxford, and he pursued astronomy with even more zest. A few years later, he described this period with: "My study was so intense that I read through and found out in a short time every hidden fact in that Science (astronomy) that is unknown to the general public."

Halley's earliest interest was in observations of the planets, presumably since there was still some controversy about planetary motions. When he was eighteen, Halley wrote to the Astronomer Royal, John Flamsteed, to communicate the results of his observations. His competence was reflected in: "I can confide to one minute (of arc) without error by means of the telescopical sights and skrew for the subdivision of my Quadrant . . ." Indeed, Halley's observations were



accurate enough that he soon wrote to Flamsteed that he had found errors in Tycho's famous catalogue?

Halley's first paper was published in 1675 (age 20), and was "a brilliant mathematical feat" in the area of planetary orbits. He left Oxford to spend a year and a half on the island of St. Helena, compiling observations with a 2 1/2 foot telescope for his mammoth work entitled A Catalogue of the Southern Stars (the full title has 103 words!). His recognition of the need for such a catalogue, and his perseverance in obtaining the observations are astounding. He wrote: "I did not go to bed when I could see the Sky was in a state to permit stv.y." How many graduate (let along undergraduate) students do you know with that kind of determination?

That Halley is famous for his work on comets is known by almost everyone. But probably the most valuable contribution to astronomy was his realization that the transits of Venus could, in principle, yield a value for the astronomical unit. He had observed a transit of Mercury while on St. Helena (" . . . obtained . . . the very moment in which Mercury, entering the Sun's limb, seemed to touch it internally . . . without an error of one single second . . ."), and this led to the development of the method (1769) and his encouragement that younger astronomers would not fail to take advantage of the upcoming transits. Although the eventual results were disappointingly inaccurate, it is fair to say that the observations were valuable and that the incredible effort involved in getting around the world in those days would never have taken place, had Halley not realized the importance of the method.

Well, what else did Halley do? Incidentally, you should impose corrective measures on anyone who pronounces Halley to rhyme with

Bailey! Legal papers of that day were written phonetically as "Hawley" or as "Hall-ey." Probably his most far-reaching but little-known efforts were in his influence in the publication of Newton's Principia.

Newton first became known to Halley after the Royal Society asked Newton to build for them one of his newly-developed reflecting telescopes. Some controversy about Newton's theory of light then arose, and Newton became even more reticent about defending his new theories, even though his brilliant mathematical reputation was well established.

Halley eventually went to Newton for help in the proof of the gravitational inverse square law (which Newton quickly came up with), and the two men became good friends. In fact, Halley quickly appreciated the breadth of the theory he and Newton discussed. Eventually Halley persuaded Newton to organize and publish his theory with geometrical proofs (Newton's fluxions were virtually unknown as yet and would not have been considered as adequate proof). Halley acted as a go-between, with the reluctant Newton on one side and the Royal Society on the other. With his intense desire to see Newton's work published, Halley agreed to oversee all of the printing details, undertake the correction of proofs, and even pay all publication costs! Newton came to have great confidence in his friend and wrote to Halley: ". . . I am very sensible of ye great trouble you are in at this business, & ye great care you take about it." In the preface, Newton wrote: "In the publication of this work the most accurate and universally learned Mr. Edmund Halley not only assisted me in correcting the errors of the presses and preparing the geometrical figures, but it was through his solicitations that it came to be published . . ."

Finally, a look at Halley's non-astronomical endeavors. One of his larger forays was in the area of deep sea diving. In 1691 Halley published four papers relating the results of his experiments in this subject. In short, Halley suggested a cylindrical container, open only at the bottom, so that when lowered into the water the trapped air would slowly be compressed and keep the water out. One could wear this contrivance while walking around on the sea floor. To overcome the problem of air compressing so much that water would rise too high, Halley suggested sending down barrels of compressed air, which would be transferred to the diving bell. It worked! But the procedure of introducing more air had to be repeated for every 15 feet of new depth-- slow business, indeed. Later models weighed up to 1 3/4 tons to ensure that they did not float, and some refinements appeared, e.g. a bench inside the bell ". . . for the men below to sitt on when they should be cold and whereon a man might sett with all his cloaths at any depth drie." A valve in the top of the diving bell let out the ". . . hott and effete air unfitt for farther respiration."

Most of Halley's non-astronomical pursuits had to do with the sea--not surprising in view of England's facility with the oceans and the lucrative contracts with the Admiralty. Halley made numerous experiments with magnets, compasses, and the earth's magnetic field. At one point, he concluded that the earth had four magnetic poles, which would explain the secular variation of magnetic poles on the earth; he thought that two of the poles might be imbedded in an inner, slowly rotating core. Halley first proposed lines of equal magnetic variation, which became known as Halleyan lines. He also wrote many

papers on the workings of barometers and on the Trade Winds. He dipped into an analysis of the composition of seawater, and the behavior of sea mussels and cuttlefish. Not surprisingly, all of this and his love of travel led to his commission as captain of one of His Majesty's ships.

Unfortunately, his crew disliked working under a non-seaman, and they mutinied. After arresting his first mate, Halley successfully ". . . brought the Shipp well home from near the banks of Newfour Land, without the least assistance from him," and arrived home ". . . having buried no man during the whole voyage and Shipp being in very good condition." The redoubtable Mr. Hawley went on to command two more voyages, mapping magnetic variation in the Atlantic from latitudes of +60° to -59°!

\*quotations taken from Edmond Halley by Colin Ronan.

by Dr. David L. Drury,  
St. Mary's University.  
submitted by Alan Blackwell.

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*              GENERAL MEETING
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*   DATE:   Tuesday, 15 April, 1975
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*   TIME:   8:00 p.m.
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*   PLACE:  Room B111, Health Sciences Building
*           ( across from observatory )
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*   PROGRAM: Regular business followed by the film,
*            "Universal Gravitation".
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As most members know, classes have been continued this year in the Fundamentals of Astronomy, and in Astrophotography, the Fundamentals class being held in the University Observatory on the second and fourth Tuesdays of each month, and the Astrophotography class meeting every Saturday at the home of Mr Patterson.

While the Fundamentals is primarily a theoretical course, designed to give members some background on Optics, Telescopes, Orbital Mechanics, Spectroscopy and its use in astronomy, the emphasis in Astrophotography has been directed almost entirely to the practical aspects. These approaches will be noted in the two annual examinations, published for the first time in this Newsletter. All members can see first hand what their compatriots, who took advantage of the opportunities available, have had a chance to learn. The examinations are designed, not to test a member's memory, but rather to determine if the member can use the sources available to him/her to find the information. It should be interesting to see how many members who did not attend lectures could answer these questions.

These courses will formally terminate with the review of the examinations 20 May for Astrophotography, and 27 May for the Fundamentals. Answers to the questions, and a list of members who passed will be published in the June Newsletter.

Mr Patterson, who started these courses soon after the formation of the Saskatoon Centre, and who has continued to give them for several years with little or no assistance from other members, has indicated he does not intend to repeat these courses. His Observatory will, however, continue to be available to Centre members for practical Astrophotography on suitable Saturday evenings, and it is hoped that the members interested in Astrophotography will continue to form a strong Activities group within the Saskatoon Centre, and be able to provide worthwhile exhibits of practical work for future General Assemblies, etc.

With the trained cadre of members available, the Centre should now consider the establishment of other working groups on such things as Variable Star observation, etc. Only practical activities can make a strong Centre.

FUNDAMENTALS OF ASTRONOMY EXAMINATION - SASKATOON CENTRE, 1975

NOTE: Any member may try this exam. Any source of material may be used for assistance, but the member must do the exam personally. Papers will be corrected at the May 27 Fundamentals Class in the Observatory. Members who obtain a 70% mark or better will be awarded a Certificate of Achievement.

- (05) 1. Calculate sidereal time for Winnipeg for 7:30 pm QDST on May 27, 1975
- (05) 2. A star is at the zenith at Winnipeg at 7:30 GST. When will the same star be at the zenith at Calgary?
- (05) 3. What are the clock times for sunrise and sunset in Regina on May 27, 1975?
- (10) 4. An asteroid has an eccentricity of 0.750, and a perihelion distance of 0.5 a.u. Determine its orbital period and aphelion distance.
- (10) 5. A 3-inch diameter convex lens has a focal length of 300 mm. Calculate the focal length of a negative lens to make an achromatic combination with an effective focal length of 800 mm. What power can be obtained using this lens combination with an ocular of 1/2 inch focal length?
- (05) 6. What is the maximum usable power and limiting visual magnitude for an f/8 telescope having an e.f.l. of 2500 mm?
- (20) 7. Determine the movement and radial velocity of a star, with respect to earth, where the spectral blue line,  $\lambda_0 = 6640\text{\AA}$  is shifted to  $6615\text{\AA}$ .
- (05) 8. A star has a visual magnitude of  $3.4^m$  and is known to be 1300 light years away. Determine the absolute visual magnitude.
- (10) 9. Detail all the information in the Observers Handbook on the star Antares, ie, color, size, magnitudes, spectral class, etc.
- (10) 10. List three methods of determining stellar distances.
- (05) 11. List five motions of the Earth, and discuss any one of them.
- (10) 12. In which constellation is NGC 6720? What is another name for this object? How would you find it without setting circles? What period of the year would this object be visible?

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NOTE: Hand-Outs are available in the Observatory Library to members only on the following topics:

Optics  
Orbits  
Telescopes  
Spectroscopy  
Stars  
Galaxies



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PRACTICAL ASTROPHOTOGRAPHY EXAMINATION - SASKATOON CENTRE, 1975  
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NOTE: Any member may try this exam. Results will be corrected at the May General Meeting, May 20, in the U of S Observatory.

- (15) 1(a) A telescope has an aperture of 10 inches and an e.f.l. of 2500 mm. A projection distance of 190 mm is used with a ocular of 18 mm e.f.l. Using Panatomic-X film and the designated filter, determine the actual exposure times and image size on film of:
- i) Venus on May 15, 1975 - #15 filter
  - ii) Moon on May 17, 1975 - #12 filter
  - iii) Saturn on March 15, 1975 - #58 filter
- Note: Use Diafine for developing.
- (b) At what time of the day or night should these pictures be taken ?
- (10) 2. Using 8x50 binoculars and a camera lens of 50 mm efl, what would be the calculated and actual exposure times and image size of the Moon and Venus on April 19, 1975. Use Plus-X film.
- (10) 3. A color slide of the full moon with half its area below the horizon is desired. Using prime focus for a Celestron 8 telescope and Kodachrome II film, what exposures would be required to ensure one good slide ?
- (10) 4. What exposure would be required to take a color slide (ASA 64) of a total eclipse of the Moon, using a 600 mm f/8 telephoto lens ?
- (10) 5. Outline the complete technique for obtaining a B&W negative of the Pleiades. Include the photography and developing.
- (05) 6. What is the approximate limiting magnitude that can be photographed using an f/10 telescope with an e.f.l. of 3500 mm ?
- (10) 7. Two B&W prints, 4" x 5", each of a different astro-subject, are to be prepared by each member of the astrophotography class, for display and judging in the U of S Observatory for the May '75 General Meeting. Pictures are to be taken and processed only by the member, mounted on poster board for display, and include all logged information on the taking and printing of each picture, together with the member's name.

(100%) \* \* \* \* \* \* \* \* \* \* \* \* \* \* \* \* \* \* \* \* \* \*

Members who obtain 70% or better will be awarded a Certificate of Achievement in Practical Astrophotography, and will be entitled to wear the Centre Astrophotography Crest

Minutes of the Executive Meeting  
 Saskatoon Centre R.A.S.C.  
 Held in the Observatory 1:30 p.m.  
 Sunday February 9, 1975

Present:	President	Halyna Kornuta	Editor	Greg Towstego
	Secretary	Melodie Andrews	Activities	Wendel Frenzel
	VP/PR	Jim Young		Merlyn Melby
	Librarian	Hugh Hunter		Doug Beck
Absent:	Programming	Dr. Holden	Treasurer	Alan Blackwell

Item	Detail	Action
56.	The meeting was opened at 1:45.	
57.	The Bid for the Gift Certificate was given to Doug Beck & Jim Young.	
58.	A letter from Halifax was read, with regard to the General Assembly.	
59.	The first observing class given by Wendel Frenzel was given. Those who attended were interested. These classes are being held on the 1st Tuesday of the month.	
60.	The 1974 year of Sky and Telescope will be bound and placed in the library.	
61.	Meeting adjourned.	Doug Beck Greg Towstego Carried

Minutes of the General Meeting  
 Saskatoon Centre R.A.S.C.  
 Held in the Health Science Bldg. Rm Bill  
 Tuesday February 18, 1975 8:00 p.m.

Present:	Secretary	Melodie Andrews	Activities	Wendel Frenzel
	Editor	Greg Towstego		Merlyn Melby
	Librarian	Hugh Hunter		Doug Beck
Absent:	President	Halyna Kornuta	Programming	Dr. Holden
	VP/PR	Jim Young	Treasurer	Alan Blackwell

Item	Detail	Action
62.	The meeting was opened at 8:00 P.M. (Chaired by Past President Wendel Frenzel.)	
63.	Motion for adoption of January minutes.	Bill McDonald Blair Peterson Carried
64.	There was an additional list of member published in the newsletter. Membership stands at 55 people.	
65.	If you do not have your handbook please let us know.	
66.	Practical observing classes are being held on the 1st Tuesday of the month.	
67.	At the Public Library, Prof. Kennedy made a display of Astronomy.	
69.	This years General Assembly is June 27 - 29 in Halifax. If you have any display ideas please let us know.	
70.	Today is the 30th anniversary of the discovery of Pluto.	
71.	The film "Mars - The Search Begins" was shown.	
72.	Motion for adjournment.	Hugh Hunter Gordon Patterson Carried

Minutes of the Executive Meeting  
 Saskatoon Centre, R.A.S.C.  
 Held in the Observatory 7:00 P.M.  
 Thursday, March 6, 1975

Present:	Halyna Kornuta	President	Jim Young	VP/PR
	Dr. Holden	Programming	Wendel Frenzel	Activities
	Hugh Hunter	Librarian	Doug Beck	
Absent:	Melodie Andrews	Secretary	Alan Blackwell	Treasurer
	Dave Pristupa			
	Greg Towstego	Editor		

Item	Detail	Action
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| 73. | The meeting was opened at 7:00 p.m.                                                                                 |                                     |
| 74. | Annual Report of this Centre will be sent to Toronto for publishing.                                                |                                     |
| 75. | General Meeting for March, will be a presentation of slides viewing Venus, Mercury, and Jupiter by Ron Waldron.     |                                     |
| 76. | Observer's Group meeting will continue on the first Tuesday at 7:30 p.m. weather permitting.                        |                                     |
| 77. | Application has been made for financial aid for our Centre representative to go to the General Assembly in Halifax. |                                     |
| 78. | The Constitution of the Saskatoon Centre and the R.A.S.C. is being reviewed by Jim Young.                           |                                     |
| 79. | The meeting was adjourned.                                                                                          | Jim Young<br>Wendel Frenzel Carried |

Minutes of the General Meeting  
 Saskatoon Centre, R.A.S.C.  
 Held in Rm B111 Health Sciences  
 Tuesday March 18, 1975

Present:	Halyna Kornuta	President	Hugh Hunter	Librarian
	Melodie Andrews	Secretary	Greg Towstego	Editor
	Jim Young	VP/PR	Dave Pristupa	
Absent:	Alan Blackwell	Treasurer	Wendel Frenzel	Activities
	Dr. Holden	Programming		

Item	Detail	Action
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|-----|----------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| 80. | The meeting was opened at 8:00 p.m.                                                                                        |                                    |
| 81. | Wendel Frenzel and Gordon Patterson gave a lecture to a group at the YMCA.                                                 |                                    |
| 82. | Secretary's Annual Report, financial statement have been sent to Toronto to be published in the Journal.                   |                                    |
| 83. | The General Assembly is at the end of June, if you have any ideas for a display would you please bring it up at a meeting. |                                    |
| 84. | Ron Waldron presented slides viewing Venus, Mercury, Jupiter and shots from the Mariner and Pioneer Missions.              |                                    |
| 85. | Meeting adjourned.                                                                                                         | Jim Young<br>Dave Pristupa Carried |