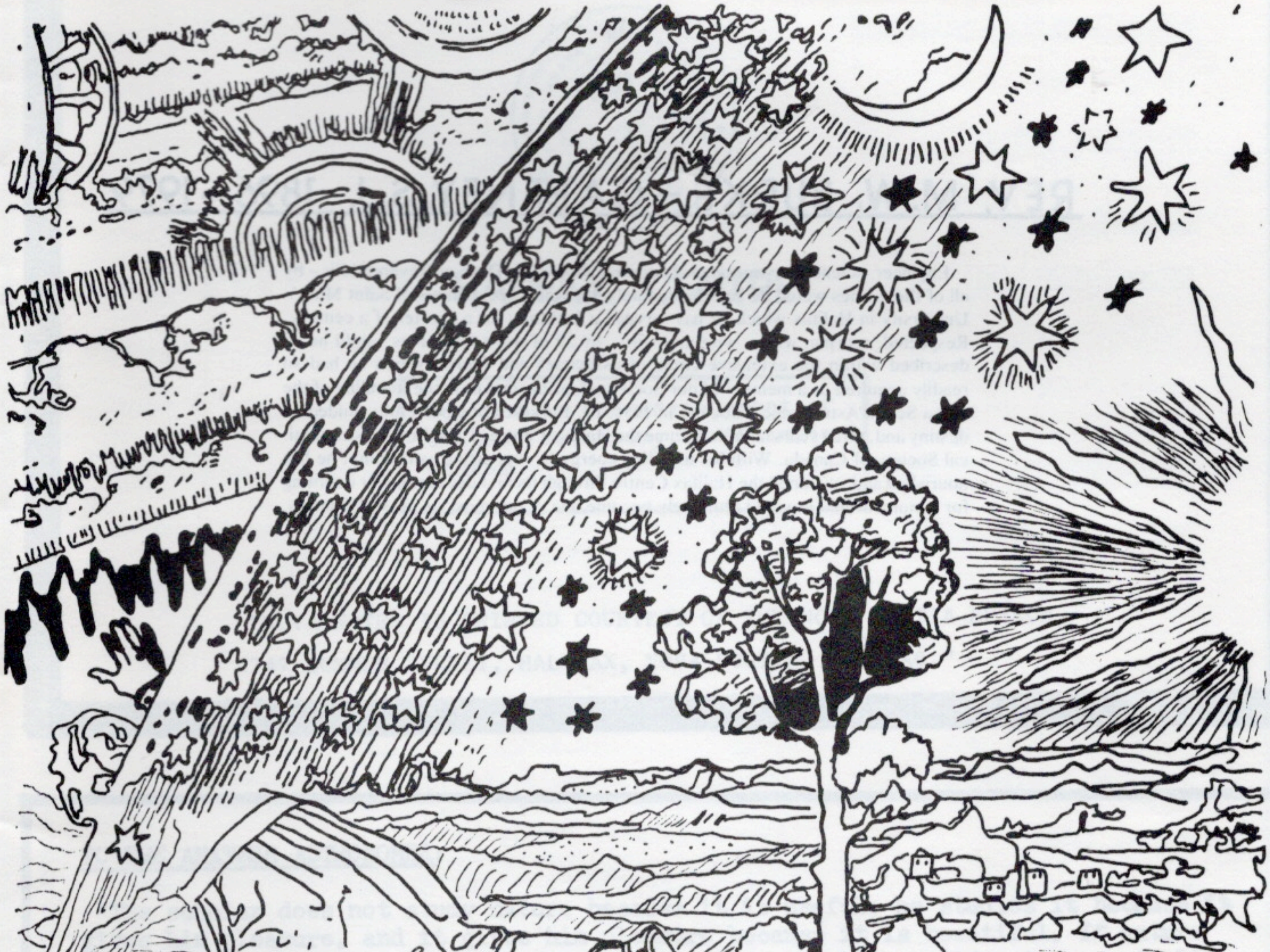
NOVA NOTES



JULY : AUG 1981

ASTRONOMY

Nova Notes Contents Volume 13/Number 4

COVER: Redrawn from a small picture in the Windsor Centre Publication. Glenn decided to expand the format of the picture and to include much detail as possible from a poorly photocopied print.

Unfortunely Glenn lost his copy and I was able to retrace the last issue of Nova Notes (on the front cover).

1981 HALIFAX CENTRE EXECUTIVE

c/o 1747 Summer Street, Halifax, Nova Scotia B3H 3A6.

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Regular Papers

PHYSICAL NATURE OF COMETS

By - Tarek Fahmi
Saskatoon Centre, RASC.

All comets have one characteristic in common- the coma, which appears as a round, diffuse, nebulous glow. As a comet approaches the sun, the coma usually grows in size and brightness. Typically it reaches a maximum size as large as or larger than the planet Jupiter. Often the small nucleus is visible in the middle of the coma. Together the coma and the smaller nucleus make up the head of the comet. Many comets, as they approach the sun, develop tails of luminous material that extend for millions of kilometres away from the head.

Far from the sun, where a typical comet spends most of its time, it is very cold and all of its material is frozen into the nucleus, thus resembling a "dirty snow-ball". About half of the nucleus is dusty, stony or metallic material, and the remainder is of substance that vaporizes at terrestial temperatures. If a comet approaches within a few astronomical units of the sun, the surface of the nucleus is warmed and begins to evaporate. The evaporated particles then begin to form a coma of gas and dust. Far from the sun, the nucleus can be seen from Earth only by the sunlight it reflects. When a coma develops, however, the dust reflects still more sunlight, and the gas in the coma, absorbing ultraviolet solar radiation, begins to fluorescent. If the comet comes close to the sun (less than five A.U.), the light that the gas atoms reemit is usually more intense than the sunlight the solid matter reflects.

From the way they reflect sunlight, we find that the nuclei of comets turn out to be only one to ten kilometres in diameter. Average nuclei are estimated to have densities about like that of water and certainly less than than two grams per cm. cube. Comet masses therefore are only about ten to the power of minus eleventh Earth masses.

The gas atoms in the coma have speeds up to one kilometre per second. At these speeds they easily escape the gravitational field of the nucleus, which is feeble at best. The coma thus expands to an enormous size as the atoms disperse into space, typically to a diameter of one hundred thousand kilometres or more. The head of a comet is, on the average, a high vacuum by laboratory standards.

The spectra of the light from common comas show that they contain the common gases - water, methane, and ammonia. Solar ultraviolet radiation disassociates molecules of these compounds into carbon, cyanogen, hydroxyl, NH and NH_2, and bright emission lines of these radicals account for most of the light from bright comets. A great deal of hydrogen is released as well. It was first detected around Comet Bennett in 1970 with the Orbiting Astronomical Observatory (OAO). Mariner 10 instruments detected radiation from hydrogen from a region around Comet Kohoutek at least forty kilometres across. Space observations of Comet Kohoutek also showed that water was disassociating into hydrogen and hydroxyl around the inner fifteen thousand kilometres of the head, and that hydroxyl further breaks down into hydrogen and oxygen beyond forty-five kilometres from the nucleus.

Every time a comet passes by the sun and forms a coma, it loses part of its material. Calculations based on the brightness of emission lines in the coma and on the radiation from the surrounding hydrogen indicate that something like ten billion molecules boil off the surface of the nucleus each second. At this rate it works out that a typical comet losses the outer few metres of its nucleus each perihelion passage. After a t most some thousand perihelions, a periodic comet uses itself up. This is why periodic comets are thought to be relative newcomers to the solar system.

How much light is emitted by the coma depends on how many atoms it contains and of what kind (which in turn depends on how rapidly they evaporate) and how much solar radiation it absorbs. As comets approach the sun and heat up, not only do the nuclei evaporate faster but more solar radiation is absorbed and reemitted by the gas; consequently comets sometimes brighten many times more rapidly than if they were merely reflecting sunlight. However, due to many variables involved (size, dust content, and chemical composition to name a few) it is not possible to accurately predict exactly how a comet will brighten.

The steady flow of cometary material from the nucleus is picked up by solar repulsive forces and driven radically away from the sun, producing the comet's tail. The orbit followed by the tail material depends on the relative magnitudes of the forces acting upon it, but in any cases is different from that of the nucleus; thus this material is lost permanently to the comet and, usually to the solar system.

The repulsive forces from the sun that produce comet tails are of two kinds; the pressure of radiation on small dust particles and some atoms and molecules, and the force of corpuscular radiation comprising the solar wind - a continuous rain of atomic nuclei ejected from the sun into space. The solar wind acting on charged atoms (ions) in the comet is the greater force and produces the straightest comet tails.

Tails generally grow in size as comets near the sun, and some tails have reached lengths of more than one hundred and fifty million kilometres. Once the tail material has left the vicinity of the comet's head, the only forces acting upon it are radial forces toward and away from the sun (gravity and the force of repulsion). As the tail material recedes further from the sun, it slows down, in accordance with Kepler's third law (refer to figure 1) and lags behind the head of the comet. Thus, in general, comet tails lie in the plane of the comet's orbit, pointing more or less away from the sun, but curving somewhat backward, away from the direction of the comet's motion (see figure 2). Most comets have two tails; a nearly straight one of ions driven by the solar winds, and a more diffuse tail of dust particles driven by solar radiation pressure. The acceleration produced by the force of repulsion from the sun varies according to the size of the particles it acts on and according to whether the particles are gas molecules or solid grains (see figure 3). Material of different types, therefore, is accelerated away from the sun by different amounts. If the repulsive forces exceeds the gravitational force on a certain kind of particle by twenty or thirty times, particles of that type are driven outward from the sun so rapidly that they form a tail that is nearly straight. On the other hand, if the repulsive force is only two or three times the gravitational force, the particles move outward more slowly; the difference between the orbital motions of the comet and tail material becomes apparent before the latter has receded very far from the comet's head, and the tail appears noticeably curved.

FIGURE 1 - Kepler's Third Law states the following rule. The squares of the sideral periods of the planets (comets included) are in direct proportion to the cubes of the semimajor axes of their orbits.

$$\frac{T_1^2}{R_1^3} = \frac{T_2^2}{R_2^3}$$

where: T_1= direction of the orbit of planet 1 and T_2= planet 2

R_1= radius of the orbit of planet 1 and R_2= planet 2

FIGURE 2 - Orbit of Comet around the Sun

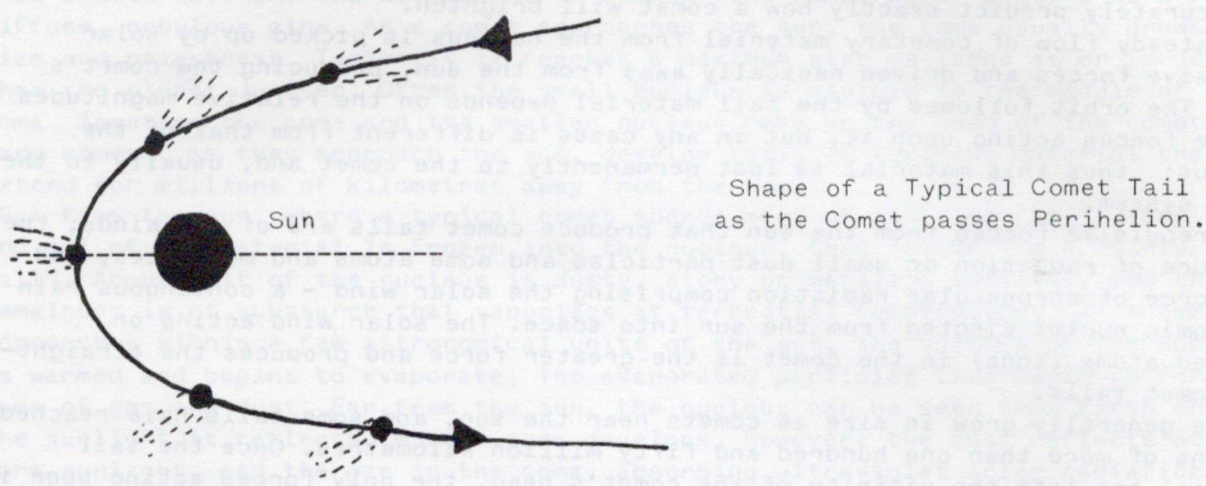
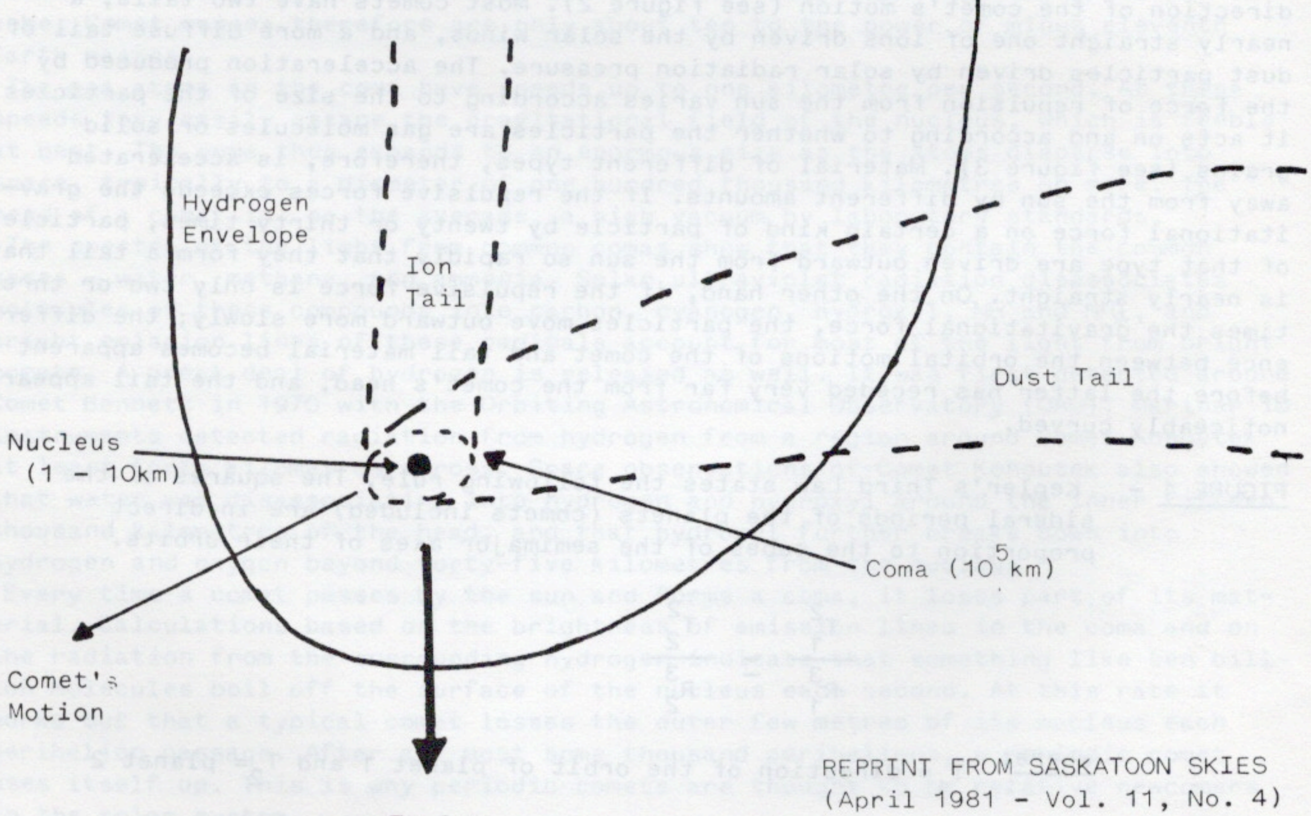


FIGURE 3 Typical Comet Structure



REPRINT FROM SASKATOON SKIES
(April 1981 - Vol. 11, No. 4)

THE MINOR PLANETS

By: Barry Sherman
Hamilton Centre, RASC

The asteriods or planetoids, as they should be more appropriately called, for they have nothing to do with stars - occupy a significant place in the structure of the solar system by *their numbers* as well as by the space which they fill.

The early members were discovered visually, the first being Ceres, noted on January 1, 1801 by Piazzi, who was compiling a star catalogue. When it's orbit was calculated, that orbit turned out to be slightly elliptical and to lie entirely between the orbits of Mars and Jupiter. This fitted with the missing planet of the Titius-Bode law, but it was soon realized that it was very small and another three objects had been found by 1807. Ceres, the largest of the planetoids, exhibits to the telescopic observer an apparent disc of 1.2 arc seconds at it's closest approach to us, corresponding to a mean to a mean diameter of close to 1000 km.

The majority of the minor planets have orbits which lie between Mars and Jupiter in a belt from 2.2 to 3.3 A.U. Within this zone the distribution is unever, with distinct peaks and depressions at particular distances. The dips are known as Kirkwood gaps after their discoverer, and are due to gravitational perturbations by Jupiter.

In August 1898, the German astronomer, Gustav Witt discovered planetoid #433. When it's orbit was calculated, it turned out that during part of it's travel about the sun it moved inward, out of the asteriod belt and past the orbit of Mars. Until then, all the planetoids had been given feminine names in accordance with the pre-cident set by the use of the name Ceres. Witt, however, gave #433 the name Eros. From then on, asteriods with orbits that took them outside the asteriod belt for at least part of their orbit have been given masculine names.

Under certain circumstances, groups of planetoids can be locked into simple orbital relationships with Jupiter. The most important of these is the group which has the same orbital period as Jupiter itself; it's members are known as the Trojan planet-oids. Their stable positions are sixty degrees ahead of and sixty degrees behind Jupiter, positions which are known as Lagrangian points after the mathematician who predicted their existance. For some unknown reason the Achilles group, which leads Jupiter, has twice as many members as the Patroclus group, which follows the planet.

A few planetoids have very large orbits; 944 Hidalgo, for example moves outward beyond Jupiter. It could be an ejected Trojan asteriod, but it would be very diff-icult to prove. The object known as 1977UB (Chiron) is remarkable as it's orbit ranges from 8.5 A.U. (inside that of Saturn) to 18.9 A.U. (close to Uranus). It appears to be either a large and never approaches close enough to develop. Either way, it is a unique object at the moment.

Inside the main belt there are are about twenty bodies which cross the Earth's orbit, known as the Apollo group after the name of the first to be discovered. One body, 1566 Icarus, has a perihelion distance of only 0.186 A.U., well inside the orbit of Mercury.

The spectral reflectivity of the asteriods surfaces indicates that these bodies can in general, be divided into two groups: the smaller group, 10- 20% of the total consist of asteriods who reflectance spectra are similar to those of stony-iron meteorites known to us from collections in museums. The larger group exhibit spectra which resemble those of the so-called carbonaceous chondrite meteorites. From a chemical point of view, the latter represent the most primitive type of material (the least heated and least metamorphosed) and contain appreciable traces of water and other volitile compounds. For example, the Trojan planetoids appear to be of this type and belong among the darkest celestial bodies in the solar system. The Martian satellites, Phobos and Deimos probaly belong to the same class- these are so dark that only about 5% of the incident light is scattered by their rough surfaces, the rest being absorbed.

Once we have established the reflectivity (or albedo) of the asteriodal surfaces and, with measurements of apparent magnitude, it is possible to calculate sizes. The diameters of some 200 objects have been established ranging from about 1200km. to 1km., with at least fourteen known to have diameters in excess of 250km. and most of these orbitting in the outer part of the belt. Although the older theory, that all the minor planets originated from the break-up of a single object, is now discounted, calculations suggest that collisions do occur, and that probably only the three largest, Ceres, Pallas and Vesta may be virtually unaltered. Fragmentation of individual bodies is considered to account for the observed families of minor planets of similar orbit and characteristics.

From known size and estimated density, the masses of the individual planetoids can be deduced with accuracy. The average density of asteroidal material ranges from 3.5 gm/cm³ for typical stony-iron to 2.6 gm/cm³ for carbonaceous chondritic bodies. In spite of the enormity of the number of solid particles revolving around the Sun in the asteroid belt, their total mass cannot exceed much more than 6% of that of the Moon. More than one-half of this material is made up by the masses of Ceres, Pallas and Vesta. The Trojan group, though numbering over 1000 bodies accounts for a mere 3-4% of the total.

REPRINTED from Orbit (April 1981 - Vol. 14, No. 4)

Asteroids for 1981

The following are a list of asteroids that will be visible for 1981. They are taken from the 1981 Observer's Handbook pp. 95 - 97. The editor of this publication is counting on a few active observers to observe these objects and perhaps giving the membership a summarization on their results (in the column, "Observing Notes").

ASTEROID	DATE	MAGNITUDE	R.A. (1950)	DEC. (1950)
Flora	Dec. 22	8.9	5h 46.2m	+18° 54'
Parthenope	July 25	9.9	19h 40.5m	-20° 15'
Eunomia	Dec. 2	8.8	5h 30.8m	+35° 17'
Melpomene	Aug. 24	8.7	22h 01.5m	-11° 48'
Lutetia	Oct. 3	10.5	0h 29.0m	-2° 58'
Kalliope	Dec. 2	10.4	4h 20.6m	+22° 15'

"Good luck in observing them"

Note: Date (0h E.T.)

Life History of Helen Sawyer Hogg

Born in Lowell, Mass., (1905), attended the Lowell schools, received an A.B. (Magna cum Laude) from Mount Holyoke College in 1926, and an A.M. 1928 and Ph.D. 1931 from Radcliffe College, Cambridge, Mass. Received an honorary D. Sc. from Mount Holyoke in 1958 from University of Waterloo, 1962 and McMaster University, 1976. She was elected a Fellow of the Royal Society of Canada in 1946 (the first woman in the Physical Sciences section). She also received an honorary D. Sc. from the University of Toronto, 1977.

When her husband, Dr. Frank Scott Hogg was appointed to the staff of the Dominion Astrophysical Observatory, Victoria, B.C. in 1931, she began an observational program on star clusters with the 72-inch reflector, at that time the second largest telescope in the world. Then in 1935 when the David Dunlap Observatory was opened and her husband joined the staff of the University of Toronto, they moved east. She has been at U. of T. ever since, and her husband was the Director of the Observatory at the time of his death in 1951. Mrs. Hogg has risen through the various ranks at U. of T. and was professor 1957-1974, Research Professor till 1976 and Professor Emeritus from July 1, 1976. On leaves of absence she has been acting chairman of the astronomy department at Mount Holyoke, and Program Director for Astronomy, National Science Fountain, Washington, D.C.

For almost fifty years her research work has been on variable stars in globular clusters. She has taken over 2000 photographs of these clusters with the giant Canadian reflectors, the 72-inch at Victoria and the 74-inch at David Dunlap, and has published over 100 papers on this work. In 1950 she received the Annie J. Cannon prize of the American Astronomical Society, an international prize awarded once in three years to a woman astronomer for her research. In 1967 she received the Rittenhouse Medal of the Rittenhouse Astronomical Society, Philadelphia; the Service Award Metal of the Royal Astronomical Society of Canada, the Radcliffe Graduate Achievement Medal, and the Centennial Medal of Canada. In 1968 she was awarded the Medal of Service of the Order of Canada and on June 26, 1976 promoted to Commanion of the Order, and invested October 20, 1976. An International Astronomical Union Colloquium was held in honor of her life work, University of Toronto, August 1972.

From January 1951 until January 1981 she wrote a weekly column on astronomy "With The Stars" in the Toronto Daily Star. She has written several dozen articles on historical astronomy in her Feature "Out of Old Books" in the Journal of the Royal Astronomical Society of Canada. In May, 1976 her popular book on astronomy, "The Stars Belong to Everyone" was published by Doubleday Canada, with a second printing in November, 1976.

In 1964 she was elected President of the Royal Canadian Institute, the first woman to hold this office. She was President of the American Association of Variable Star Observers, 1939-41, of the Royal Astronomical Society of Canada, 1957-59, of the Physical Sciences section of the Royal Society of Canada, 1960-61 (the first woman), of the International Astronomical Union Subcommission "Variable Stars in Star Clusters", 1955-61. She was the first president of the Canadian Astronomical Society, 1971-72. She was a member of the Council of the American Astronomical Society, 1965-68, and is a member of many other societies, including Phi Beta Kappa and Sigma Xi. Elected Honorary President, Toronto Centre, RASC, 1972-77, Honorary President of the RASC, 1977-81.

In March, 1968 she and Madame Vanier were the first women to become Directors of the Bell Telephone Company of Canada. Mrs. Hogg has been re-elected as a Director at every annual meeting since then, until her retirement in 1978.

She has one daughter and two sons, and seven grandchildren. Her older son David is also an astronomer, with a Ph. D. from University of Toronto, and a Scientist on the staff of the National Radio Astronomy Observatory, Charlottesville, Virginia.

At the 1981 Spring Convocation (Saint Mary's University), Dr. Helen S. Hogg had received her degree of Doctor of Letters.

HALIFAX CENTRE ACTIVITIES

CAMPING & OBSERVING WEEKEND

Date: July 31 - Aug. 3
Where: Kedji Group campsite #2

For more information please contact Dale Ellis at 466 - 7315.

PERSEID METEOR SHOWER

Date: Tuesday, August 11th
Where: Maktomkus Observatory, Avonport, N.S.

Again this year, Roy Bishop has invited us to his home, to witness the Perseid Meteor Shower and also to enjoy a picnic near his observatory.

Don't forget to bring your barbecue and food for this event.

For more information please contact David Tindall at 455 - 7456.

NOTE: Members who require transportation for either event please let Dale or David know. Members who can take one or two members along with them, please inform us.

NOTES FROM OBSERVATORIES

HERZBERG INSTITUTE OF ASTROPHYSICS

Canadian astronomers using the radio telescope at Haystack Observatory in Westford, Mass., have made an important discovery. The team of NRC astrophysicists, headed by Morely Bell and other colleagues Paul Feldman and Sun Kwok, have uncovered the longest and heaviest molecule ever. The team focused their attention on a Carbon Star, called CW Leo, 630 light years away.

The discovery of the HC11N molecule (Cyano-decapenta-yne) is composed of one hydrogen, eleven carbons and one nitrogen, arranged in a complex molecular structure. HC11N is thought to be made of the same chemicals as amino acids (the protein building blocks in human bodies). The average molecular weight of twenty amino acids is 137, but the molecular weight of HC11N is 147. Unfortunely HC11N is much too dangerous to prepare in a laboratory (too explosive).

Herzberg astronomers have made their fourth detection of heavy, complex molecules and other research institutions have been unable to detect them. The other three discoveries were made at the Algonquin Radio Observatory (Algonquin National Park), these were HC5N, HC7N and HC9N. A decision by Herzberg astronomers was to move from their present location to Haystack, due to poor reception at their site.

Nearly 15 years ago, astronomers believed that there could not be any molecules in space. But in 1969, Berkeley astronomers detected the first complex molecules, water and ammonia. Since then, astronomers have found molecular structures to vary from simple to very complex. Such molecules are believed to be manufactured and ejected by dying stars.

KITT PEAK NATIONAL OBSERVATORY

Geoffrey Burbridge PHD, Director of the Kitt Peak National Observatory, recently attended the 1981 "Form for Ideas" at the University of Ottawa. On March 9th, Yatendra Varshni PHD introduced Geoffrey to the audience and Geoffrey gave a lecture on the "Riddles of the Redshift". Geoffrey went into great detail expanding the redshift phenomena. Discussion was based on different redshifts occurring for individual members of groups of galaxies which appear to be physically connected. There was some controversy expressed by Yatendra who apparently does not believe in redshifts.

RADIO-PHYSICS OBSERVATORY

The Radio-Physics Observatory at Saint Mary's University has been closed for several months, until the workmen finish resurfacing the roof (McNally Building). All the radio telescopes have been dismantled and shifted to another section of the roof. Meanwhile the control room has been given special attention by Father William P. Lonc. The room has been expanded and insulated.

The observatory is the only one of its kind east of Ottawa (Indian River Observatory), to house amateur built radio telescopes. It is hoped that the 21cm radio telescope will be in operation by the fall of 1981. The radio astronomical project began back in 1975, and since has grown to quite a size. A number of instruments have been recently erected along the baseline. Operating systems include two 1.15m, a 69cm, a 21cm, and a 3cm radio telescope. The 14cm radio telescope is near completion and two other systems are in the construction stages.

(Next issue: Radio Astronomy at the Ottawa Centre, RASC and a trip to Mauna Kea.)

OBSERVING NOTES

PERIODIC COMET SWIFT - TUTTLE, 1862 III

Recently at the Havard - Smithsonian Centre for Astrophysics, Brian G. Marsden had concluded his studies on the orbit of Comet Swift-Tuttle. His results indicate the return of this famous comet during the second half of 1981. Comet Swift-Tuttle is thought to be the progenitor of the Perseid meteor stream.

By using Marsden's calculations, the date of perihelion passage has been determined as of September 16th. Since the comet has not been recovered, the desired date maybe considerably in error. Correction factors are provided in the ephemerides, for which they maybe added to the right ascensions and declination values. This would result in new positions, assuming the perihelion passage occurs thirty days earlier or later than the predicted time.

Ephemerides

The right ascenion and declination values for the comet are determined at zero hrs. universal time. One must keep in mind that the 1950 cooridinates are being applied for the R.A. and Dec. calculations. The angular elongation (Elong) of the comet is referenced by morning (MO) and evening (EV) depending on its location in the sky. The predicted visual magnitude (M1) and the correction factors for the alternate perihelion passages are found situated in the below table.

date UT		R.A.	Dec.	Elong	m_1	T-30^d		T+30^d	
Jun.	1	05^{h}46^m.4	+60°21'	40°EV	11.9	- 77^m.3	+ 0°.9	+ 50^m.3	- 2°.7
	11	05 55.2	+60 38	38 EV	11.4	- 80.2	+ 1.0	+ 50.6	- 3.0
	21	06 05.9	+61 14	38 EV	10.9	- 85.0	+ 1.1	+ 51.1	- 3.3
Jul.	1	06 18.7	+62 11	39 MO	10.3	- 91.7	+ 1.4	+ 51.7	- 3.7
	11	06 34.4	+63 34	42 MO	9.6	-100.8	+ 1.7	+ 51.9	- 4.3
	21	06 54.7	+65 28	46 MO	8.8	-112.4	+ 2.5	+ 50.9	- 5.1
	31	07 24.1	+68 02	51 MO	8.0	-125.4	+ 4.1	+ 45.6	- 6.2
Aug.	10	08 14.2	+71 16	56 MO	7.1	-109.5	+ 8.3	+ 27.5	- 7.7
	20	09 58.2	+74 16	62 EV	6.1	+257.3	+ 0.8	- 30.8	- 8.7
	30	13 02.7	+71 05	66 EV	5.1	+161.7	-57.2	- 45.1	- 3.9
Sep.	9	15 16.6	+51 37	69 EV	4.2	+ 45.9	-79.4	-173.9	+14.9
	19	16 16.7	+17 53	69 EV	4.1	- 5.5	-59.0	-114.6	+41.4

Note: If perihelion should take place about eight weeks earlier than excepted, the comet will pass very close to the Earth than previously predicte. This occurence should happen between August 11/12, during the Perseid shower. The comet would transverse the sky at a rate of ten to twenty degrees per day. The visual magnitude of the comet would result in magnitudes brighter than Venus.

Reference: Comet Circular No. 19, from the W.R. Brooks Observatory (J.E. Bortle).

Perseus

By: Norman Scrimger

This month's feature constellation is, not surprisingly, Perseus. As anyone who has watched the Perseid Meteor Shower of any year will know, Perseus rises a little after sunset in mid-August.

Since the mythological story of Perseus is very well-known, it is only briefly outlined here. Perseus was returning from slaying the Medusa, whose head had tucked in a pouch marked by the star Algol. He chanced upon the beautiful Andromeda who was chained to a rock on the sea and left for the Sea Monster, Cetus. After dispatching Cetus by using the power of the Medusa's head, he turned his attention to loosing Andromeda. Neptune, who had demanded Andromeda's sacrifice to his sea monster was outraged and caused Pegasus, the winged horse, to spring from the drops of Medusa's blood that hit the sea. The horse carried off Andrômeda, now chained to his back, with Perseus in close pursuit. They are all now found perpetually in chase among the stars.

There are several noteworthy objects within the area of the constellation that are of interest to viewers using binoculars or telescopes. The beautiful pair of open clusters, h and chi Persei are easily found on the Milky Way between Perseus and Cassiopeia. These are best seen with low magnification. The large open cluster M34 in Perseus also is best viewed at very low magnification. The galaxies, M31, M32, and NGC 205 are local group galaxies worth finding with a small telescope. M31 can be seen by the unaided eye if you look in the right place on a dark night. Another nearby local galaxy is M33 in Triangulum which is a large diffuse spiral.

The radiant of the Perseid meteor shower is marked at its approximate position on the accompanying chart. This point will be very near the north-eastern horizon at sunset, but of course meteors can be found anywhere in the sky radiating from this point. Since the 12-day old moon will be setting after 2:00 a.m., the radiant will be well up when the sky gets quite dark early in the morning of August 12th. We can all hope for clear skies on the night of the shower, and thank Roy Bishop for his kind invitation to view the shower from Maktomkus Observatory.

The accompanying chart is found on the next page, under "CONSTELLATION".

STELLAFANE - August 1st., 1981

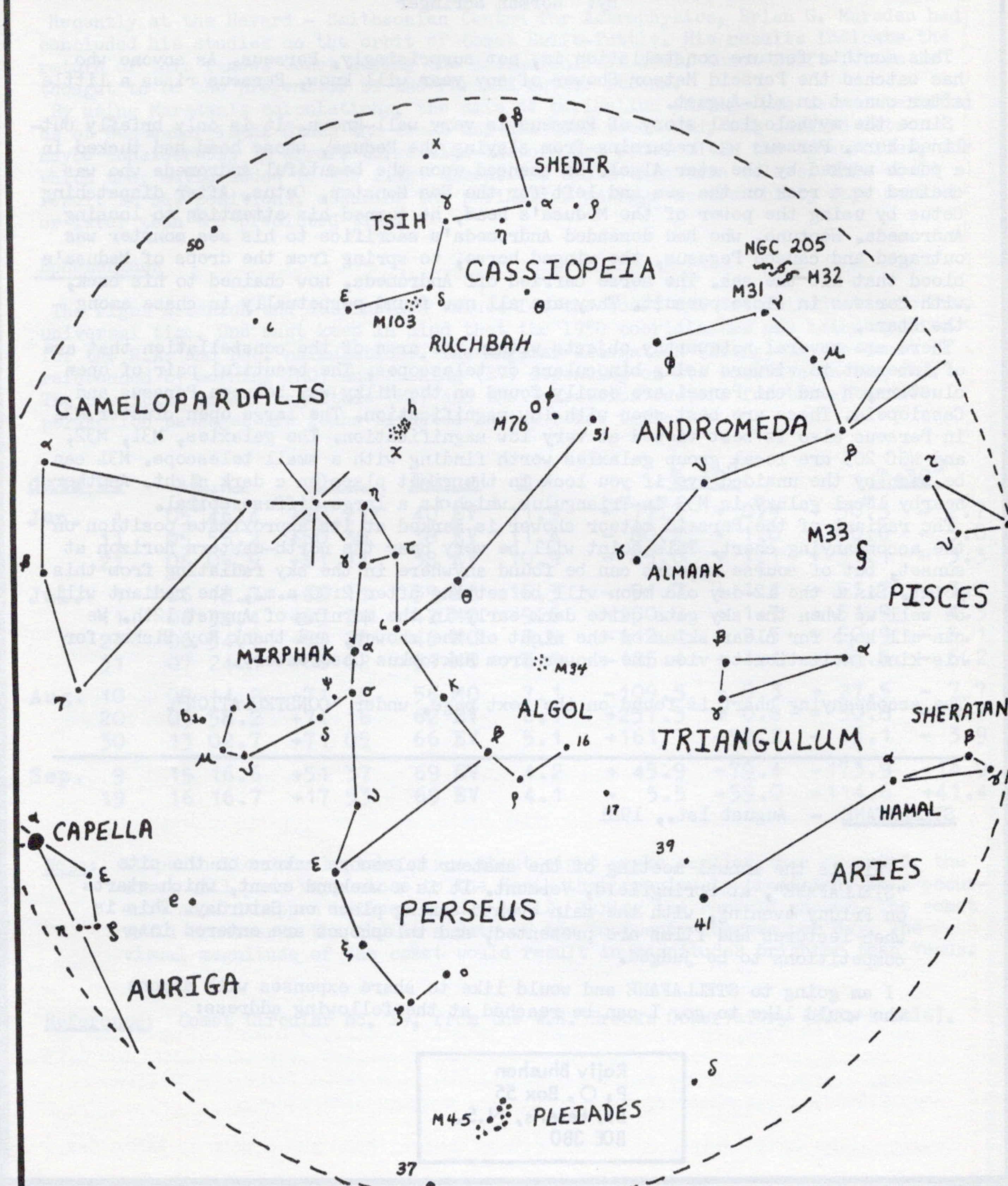
This is the annual meeting of the amateur telescope makers on the site "STELLAFANE", at Springfield, Vermont. It is a weekend event, which starts on Friday evening, with the main events taking place on Saturday. This is when lectures and films are presented, and telescopes are entered into competitions to be judged.

I am going to STELLAFANE and would like to share expenses with anyone who would like to go. I can be reached at the following address:

Rajiv Bhushan
P. O. Box 55
St. Peter's, N.S.
BOE 3BO

CONSTELLATION

This chart was prepared by Norman Scrimger



EDUCATION NOTES

The following notes were prepared by Randall C. Brooks

Prospects for Halley's Comet

In a recent issue of Observatory, Jeremy Tatum of the University of Victoria has reconsidered the orbital path of Halley's Comet for 1986. He concludes that contrary to most reports, you should stay at home for the event and not bother venturing to southern climates. At perihelion in early 1986, the comet will be south of the celestial equator- but so will the Sun, a fact which has been ignored. What's important is the relative position on the sky of the Sun and comet.
For the two weeks before perihelion passage on February 9, 1986, the comet will be north of the Sun and will be best seen from latitudes +30° - +70° just after sunset. After 9 February, it will be seen by southern observers after a few weeks. Just ten days before closest approach to Sun, Halley's Comet will be seen for almost 1½ hours by observer's at our latitude. So much for the good news. The bad news is that even at its brightest, Halley's Comet will only reach magnitude +3. Oh well, maybe next time - in 2062 that is.

Ice & Meteorites:

Antartic Meteors

Several years ago, the glaciers of Antartica were discovered to hold many meteors particularly at points where glacier motion had piled ice (such as at the bases of mountains) and then receeded. This process, much like that which formed Nova Scotia's drumlins (eq. Citadel Hill), created concentrations of meteors. Large numbers of these have been retrieved and because of the cold environment are uncontaminated by terrestial organisms. One iron meteorite recent examined by the Smithsonian was found to have small diamond particles embeded throughout. The small size of the fragment infers that these particles could not have been formed at the time of its decent through Earth's atmosphere but must have formed from the violent collision of larger iron meteors in space. The only other meteorites to contain diamonds are the fragments of the meteor which created the large Arizona crater where the formation of diamonds was a result of the explosive impact. Thus this newly found diamond studded meteor is a very significant find- not for its monetary value but for the scientific implications for theories of planetesmal acretion.

Ice Ages & Meteors

Our free thinking British friend Sir Fred Hoyle has come up with more controversial ideas which are expounded in his new book Ice.. Its been suggested for more than a century that following a great volcanic eruption, world temperatures drop very slightly as a result of increased dust in the atmosphere. In Ice Hoyle has resurected the 1960's Theory that past, great meteor collisions with Earth have thrown tremendous amounts of dust into the upper atmosphere causing cooling because of the absorption of energy before reaching Earth's surface. Hoyle further speculates that a meteorite collision could inject significant amounts of dust into the stratosphere where the particles act as centres for the formation of super cooled ice crystals which he calls "diamond dust". This diamond dust reflects sunlight and heat back to space accentuating the cooling and he speculates that under certain conditions could result in the onset of an ice age.

(Continued on the next page)

Ice discusses geological and historical explaination of ice ages as well. What he adds which is new and interesting is a mechanism whereby Hoyle theorizes meteor impacts can cause the end of an ice age. But you'll have to read the book to find out what it is. Hoyle has drawn a lot of frowns and critism from other scientists, so read it with a slightly sceptical eye !

(Ice, Fred Hoyle, Hutchinson Pub. pp. 191, ~ $20, in hardcover).

THE MAN WHO BELIEVES IN FOREVER

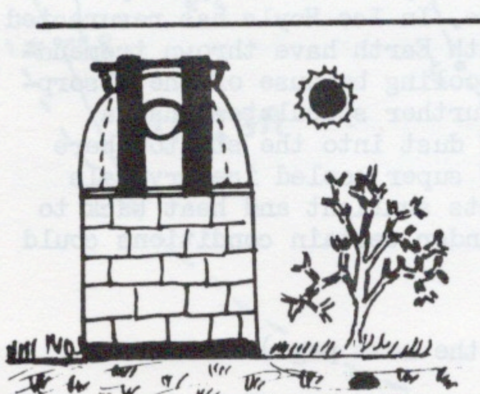
At 65, astronomer Fred Hoyle has retired to the mountains of northern England, but it is too soon to say that he is over the hill.

This four-page article appeared in the May 1981 issue of Discover. A photocopied version of this article can be obtained by sending 40 cents to Nova Notes. Please allow two weeks for delivery by mail.

CHARGE - COUPLED DEVICE (Silicon Image Sensor)

Recently scientists and engineers at RCA research and development laboratories, have developed a tiny silicon chip for the detection of very faint optical sources. The Charge-Coupled Device (CCD) is placed inside a camera, and then attached to the telescope. CCD is able to resolve dim blur images in the telescope, with astonishing clarity and brilliance. CCD makes it possible to increase the resolution factor of larger telescopes, to a power of 5 to 10 times more than conventional photographic techniques. The electrical properties of the silicon chip transform the visual image into thousands of digital signals. The information contained in the digital codes can be fed directly into a computer system for immediate analyzation or displayed on a graphics terminal.
CCD technology allows the astronomer to obtain quick and accurate results from his observations, without any delay.

Both articles compiled by William J. Calnen



If you should have any comments or suggestions regarding the layout, format, or method of article presentation, please write to the following address:

William J. Calnen
14 Green Acres Road,
Halifax, N.S.
B3R 1C6

Canada's First Teaching Observatory

One year after France recaptured Louisbourg from the English, they had many losses to their Navy due to fog and unmapped reefs along the Atlantic Coast. It was the decision of the French government to have the Minister of Marine remedy this, as Louisbourg needed supplies and reinforcements.

They found an officier in the Navy named Joseph Bernard Chabert a brilliant scholar in astronomy, mathematics, surveying and navigation. He was ordered to prepare and get supplies aboard the frigate La Mutine, and set sail for Isle Royale and Louisbourg.

In June of 1750, Chabert left Brest and arrived in Louisbourg in early August, delayed by fog. He had on board six refractor telescopes with focal lengths of three to thirteen feet and a Gregorian telescope of three feet focal length made from drawing by James Gregory. Also on board were many text books, terrestrial globes, star maps, an octant (an early type of sextant), and a surveying telescope with a spirit level mounted on top of the barrel.

At this time, there were about four thousand people in Louisbourg many from the previous occupation. The Governor built him an observatory on the wall of King's Bastion or Citadel. Chabert also taught astronomy, navigation, surveying and cartography.

Chabert mapped the reefs and inlets along the atlantic coastline and found the correct latitude and longitude of Louisbourg by using information sent to him by Edmond Halley R.A. which was also used in teaching navigation.

His work on Isle Royale was well known in Europe, for that he was rewarded by France by being made a Vice Admiral. Later, his contributions to science and astronomy were well documented.

The French may have taken his instruments away when they fled from Louisbourg in 1757, but as for the fate of the observatory, we can guess what became of it when the English razed and completely destroyed this historical landmark for the second time.

Condensed from Jan. '81,
Canadian Geographic

by: Eric Orr
Hamilton Centre, RASC
Orbit (Vol. 14, No. 2)

Contributions for Education Notes should reach the Acting Editor by August 15th. Articles for this issue were compiled by Randall Brooks and William Calnen. Eric Orr's paper which appeared in Orbit (Hamilton Centre Publication) was considered for reprinting in this section. We hope teachers out there will submit to these pages.

NOTES FROM THE NATIONAL OFFICE (RASC)

NOTICE OF ACCLAMATION

The Nominating Committee presented the following candidates for the Elective Offices and as no further nominations were received by April 28th, 1981, (60 days prior to the Annual Meeting), these have been elected by acclamation:

HONORARY PRESIDENT: Peter M. Millman (4-year term)

SECRETARY: Peter Broughton (1st of a 3-yr term)

NOTE ON CANDIDATE FOR THE OFFICE OF HONORARY PRESIDENT:

PETER M. MILLMAN: A native of Toronto, received his B.A. in Astronomy and Physics from the University of Toronto in 1929, and his A.M. and Ph.D. in Astronomy from Harvard University in 1931 and 1932 respectively. Joining the staff of the David Dunlap Observatory in 1933 he spent six years in the R.C.A.F. on active service, both in Canada and Overseas, during the war years. In 1946 he was appointed Chief of the Stellar Physics Division at the Dominion Observatory, Ottawa, and in 1955 took a position as Head of Upper Atmosphere Research at the National Research Council of Canada. On retirement in 1971 he remained as a Guest Worker at the Council, his present position. His professional career has involved research in stellar radial velocities, meteoritics and planetary science. Peter Millman joined the R.A.S.C. in 1925 and, over the years, has held various offices including a term as National President, 1960-62.

NOTE ON CANDIDATE FOR THE OFFICE OF NATIONAL SECRETARY:

R. PETER BROUGHTON: Peter has been a high school teacher since graduating from the astronomy division of the Maths and Physics course at the University of Toronto in 1963, but he has also given introductory astronomy courses to various groups and was a teaching assistant at the University of Toronto for several years. He has previously served the R.A.S.C. as Librarian and Treasurer and is presently the Society's Archivist and Chairman of the Property Committee. Married with two children he finds some spare time to devote to historical astronomy and music.

TO ALL MEMBERS OF THE ROYAL ASTRONOMICAL SOCIETY OF CANADA

Notice is hereby given of a Special General Meeting of the Members of the Royal Astronomical Society of Canada to be held on Sunday, June 28th, called for the purpose of sanctioning the By-Laws of the Society enacted by the Council at a meeting held January 31, 1981, as follows:

By-Law No. 9

Membership Fees

"BE IT ENACTED by the Council of the Royal Astronomical Society of Canada and it is hereby enacted as By-Law No. 9 of the Royal Astronomical Society of Canada (herein called the Society) as follows:

That paragraph 4(a) of By-Law No. 1 be amended by deleting the said paragraph and substituting therefor the following:

"4(a) The annual fees for the year 1982 shall be as follows:

Ordinary Members	$20.00 annually
Youth Members (under 18 years)	$12.50 annually
Life Members	$300.00

and thereafter the annual fees for Ordinary Members, Youth Members, and the fees for Life Members shall be an amount as determined from time to time by the Council, subject to ratification by the membership at the next Annual Meeting."

By-Law No.10

Honorary President's Term

"BE IT ENACTED by the Council of the Royal Astronomical Society of Canada and it is hereby enacted as By-Law No.10 of the Royal Astronomical Society of Canada (herein called the Society) as follows:

That the following paragraph be added to Article 11(c) of By-Law No.1 :

"The Honorary President shall be appointed by the Council, after consideration of any recommendation of the Nominating Committee. The normal term shall be four years, beginning and ending at the Annual Meeting, and the Honorary President is not eligible for re-appointment. If the position falls vacant between Annual Meetings, Council may appoint an Honorary President whose term shall expire four years after the next Annual Meeting."

HALIFAX CENTRE NOTES

The following was prepared by William J. Calnen

Annual Dinner

This year the Halifax Centre held its annual dinner at Chinatown in Bedford. About twenty-four members were present to enjoy the Chinese and American cooked dishes. A cash bar began at 7:00 pm. as members arrived with their wives, girl friends, etc. David Tindall arrived, armed with a slide projector and screen. The response was alarming as the food was placed along the table.

After dinner, when tea and coffee were being served; David Tindall began the opening address to the membership. He first welcomed William Holden M.D. (our Honorary President) to the province, after a long winter stay in the United States. David also mentioned that Murray Cunningham left for China and was unable to attend the dinner, but is probaly enjoying the Chinese food over there.

Several members of the Executive were not present, these included Peter and Mike Edwards, Mike Boschat, and Glenn Graham.

The slide show followed the opening address. Dale Ellis, Larry Coldwell, Roy Bishop, and David Tindall were prepared to give the members a night to remember.

The evening rounded off with members enjoying a drink of coffee and tea, as photographs were taken of the Executive (these should appear in the Sept./Oct. issue).

The Halifax Centre Executive would like to thank Dale Ellis, Mike Edwards and David Tindall for their support in organizing this event.

Astronomy Day

On May 9th, the Halifax Centre celebrated Astronomy Day in conjunction with our observational astronomy display at the Nova Scotia Museum. Two events were planned, these included the observation of the Sun (2 - 4 pm.) and an evening observing session (8 - 10 pm.) in the museum parking lot.

Five telescopes were present for the afternoon observing session, while some fifty on lookers had a chance to observe the Sun and Moon. Dale Ellis brought his Celestron 8, Randall Brooks came equipped with the SMU Questar, Peter Steffin decided to employ his Celestron 8, and a C-90 was also present. Dale, Randall, Peter, Diane, and David were the hosting astronomers for this event.

The evening observing session began with clear skies, but a little colder than expected. Dale, Randall and Diane came equipped with their telescopes. About twenty people showed up to enjoy the viewing and also to enjoy our refreshments. Randall gave a short talk on the Jupiter - Saturn space mission (NASA & JPL). After his talk, a film recently obtained was shown to the audience. Later, a film on the CFH Telescope (Mauna Kea) was shown, which was obtained from the Atlantic Regional Office of the National Film Board (see Media Review).

Concluding the day's activities, the observations of the Sun was the main event and the public seemed to enjoy this the most, because our regular observing sessions are held at night (after sunset).

Diane Brooks found time during the day to work on our Centre Library and Randall seemed to be everywhere, whenever help was needed. David and Dale did an excellent job in the preparation of this event. Michael Boschat was on hand for the evening observing session, to assist the public.

Rev. M.W. Burke - Gaffney Award

The next issue of Nova Notes will content the results of this award, which was presented to Diane Brooks of Dartmouth.

Societies Show

This year the Nova Scotia Museum approached our Centre in preparation of an astronomical display for the "Societies Show". Through the efforts of the Executive, a display was assembled on April 29th. Earlier in the year, Roy Bishop suggested the theme "Observational Astronomy", for which the display is based upon.

Peter Edwards arranged for the cases and made the necessary contacts with the Museum Staff in February. Photographs for the display were on loan from Glenn Graham, Mike Edwards, Randall Brooks, Mike Boschat, Jody Leblanc, and William Calnen. Diane Brooks loaned her C-90 telescope and David Tindall was able to display Dal's 3½-inch Questar telescope.

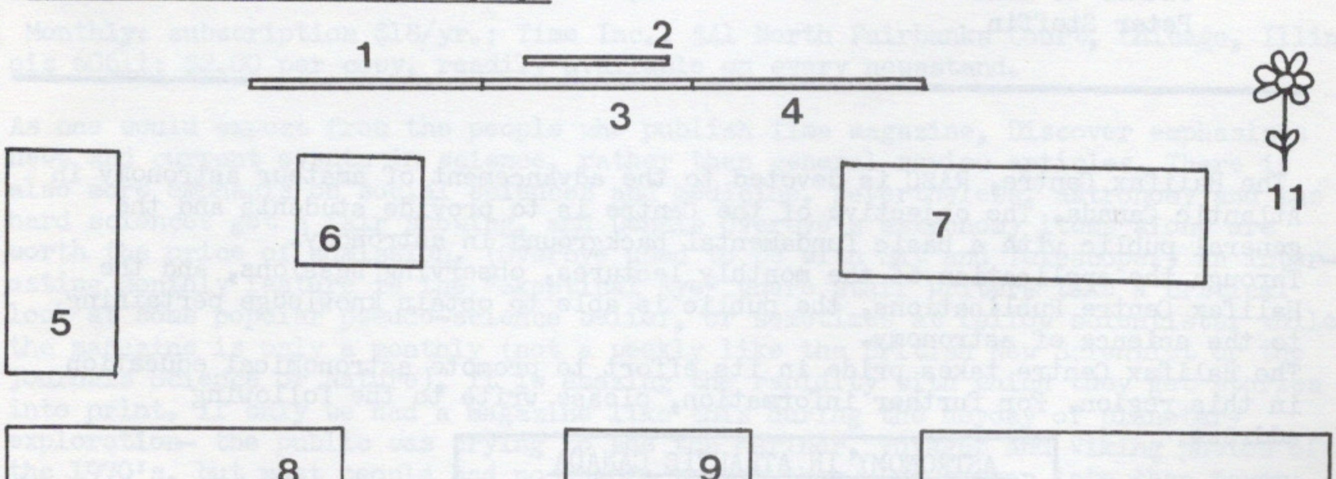
A display of photographs and chart recordings of the Sun and radio telescopes, were kindly borrowed from the Radio-Physics Observatory (Saint Mary's University). These included several photographs of the radio telescopes found situated on the roof of the McNally Building. One photograph shows the 21cm radio telescope which was constructed by Father William P. Lonc and John Haranas (both members of the Centre). This may be the only amateur built telescope of its kind in Canada, which is capable of detecting neutral hydrogen.

Before the Simon Newcomb Award left for Victoria with Glenn (our G.A. representative), Mike Edwards placed the Award in one of the display cases.

A fine mirror grinding exhibit was prepared by Dale Ellis, which illustrates the procedure involved in the completion of an astronomical mirror. Several plastic dishes contained the required grinding components which ranged from ver coarse to a fine powder. An incomplete mirror and tool were shown beside the component (#120) which was being used to generate the desired curve. Dale used captions to illustrate each item in his display. An eyepiece and ellipically diagonal were just some of the items shown for the construction of a telescope.

The Astronomer's highway map to the stars (Atlas Coeil) was on display in the large display case. The Edwards brothers displayed the NASA Shuttle Craft poster which attracted alot of attention from the public. Randall displayed his 1,000,000 Galaxies poster. Randall, Jody, and Glen contributed photographs to the Halifax Centre Activity Display, which showed members busy observing celestial objects and other astronomical events.

"Observational Astronomy Display"



Key to Diagram

1 - poster on NASA Shuttle Craft
2 - RASC Poster (Display title suspended from ceiling
3 - poster on 1,000,000 Galaxies
4 - Astrophotography Display
5 - Make Your Own Mirror (Dale)
6 - 3½-inch Questar (Dept. of Physics, Dalhousie University)
7 - Photographs of Halifax Centre Activities
8 - Atlas Coeil (Astronomer's highway map to the stars)
9 - Radio Astronomy Display (Dept. of Physics, Saint Mary's University)
10 - Display of RASC Publications; C-90 telescope; Simon Newcomb Award
11 - plants (from the Museum)

Captions were placed in each exhibit describing the nature of the item and a note of thanks to the loaner.

The Halifax Centre Executive would like to thank the following members for their assistance and efforts during the duration of the Societies Show. The Executive would also like to thank the members who contributed to the display. The Centre would also like to thank the Nova Scotia Museum and its Staff, for allowing us to promote astronomical education to the Province of Nova Scotia.

Mike Edwards	Randall Brooks
Peter Edwards	Diane Brooks
David Tindall	Mike Boschat
Dale Ellis	Glenn Graham
Barry Mouzar	Kevin Ells
Father W. Lonc	Jody Leblanc
Peter Steffin	

The Halifax Centre, RASC is devoted to the advancement of amateur astronomy in Atlantic Canada. The objective of the Centre is to provide students and the general public with a basic fundamental background in astronomy. Through the application of the monthly lectures, observing sessions, and the Halifax Centre Publications, the public is able to obtain knowledge pertaining to the science of astronomy.
The Halifax Centre takes pride in its effort to promote astronomical education in this region. For further information, please write to the following address:

ASTRONOMY IN ATLANTIC CANADA

c/o 1747 Summer Street,
Halifax, Nova Scotia
B3H 3A6

Book Review

THE INFORMATION EXPLOSION

By: Alan Dyer
Edmonton Centre, RASC

One of the biggest science news stories over the last 2 years is one you won't read about in the new science magazines. Why? Because the story is those magazines.

Evidence for the current popularity of science and astronomy can be found every month on the newsstands. During the last 2 years, major new science magazines have been launched by companies like Time-Life and the Hearst Corporation. Catering to the scientific curiosities of a new generation of readers has become big business in the magazine publishing world.

True, there are many more science books being published today than ever before, but most of these are still only available through mail order firms. Most bookstores here in Edmonton still have shoddy, poorly-stocked science sections.

But by contrast, most of today's science magazines are easily found on newsstands. Here is a brief rundown:

OMNI

Monthly: subscription $24.00 U.S./year; Subscription Dept., P.O. Box 908, Farmingdale, N.Y., 11737.; $2.25 per copy, available on just about every newsstand in the entire universe!

OMNI is the thick, glossy blend of science and SF that started the new science information explosion in 1979. Oddly enough, it has been surpassed by newer entries into the market, at least when judged on the quantity of its content of hard science. OMNI has remained primarily a magazine for the visual and literary SF arts. The amount of substantial science information in it each month is small, though well-written. The interviews with scientists are excellent, and are still OMNI's forte. It's a magazine definitely worth checking out each month.

DISCOVER

Monthly: subscription $18/yr.; Time Inc., 541 North Fairbanks Court, Chicago, Illinois 60611; $2.00 per copy, readily available on every newsstand.

As one would expect from the people who publish Time magazine, Discover emphasizes news and current events in science, rather than general review articles. There is also more emphasis on social sciences and medicine. Nevertheless, astronomy and the hard sciences get a fair showing, and Dennis Overbye's astronomy items alone are worth the price of admission. (Overbye used to be with Sky and Telescope.) An interesting monthly feature is the "Skeptical Eye" where staff writers take a critical look at some popular pseudo-science belief, or sometimes at fellow scientists. While the magazine is only a monthly (not a weekly like the British New Scientist or the journals Science or Nature), it is amazing the rapidity with which they get stories into print. If only we had a magazine like this during the heyday of planetary exploration- the public was crying to see the Mariner, Voyager and Viking photos of the 1970's, but most people had no chance to see them. But better late than never; kudos to Time-Life for recognizing the news value of science.

SCIENCE '81

Monthly, except bi-monthly Jan/Feb and July/Aug: subscription $17.00 U.S./yr., Subscription Dept., P.O. Box 10790, Des Moines, Iowa, 50340; available only by subscription.

It is a shame that this magazine is not on the newsstands each month, though it may distributed this way later in the year. Science '81 is published by the prestigious American Association for the Advancement of Science. They felt a need for a sister publication to Science, one that would convey the result of research to the interested layman, (They also publish the weekly research journal Science). Last year they started up Science 80 with great success. And deservedly so, for the quality of the writing is very high, and the layout very clean and uncluttered. The overall style is more conservative than Science Digest, but it is by no means a stodgy or technical magazine. As with most general science publications, there is usually an item about astronomy in each issue, and their coverage of stories is always refreshing and informative. If you hesitate about subscribing sight-unseen to a magazine, you needn't worry about this one. Science '81 is well worth the price. And, issues usually arrive on time!

SCIENCE DIGEST

Monthly: Subscription $16.97/10 issues, $18.97/12 issues, $29.97/20 issues, $33.97/24 issues (all in U.S. funds); P.O. Box 10076, Des Moines, Iowa, 50350; $2.00 per copy, available on most newsstands.

This new publication replaces the old, pocketbook-sized pulp "Science Digest" monthly. Issued as a quarterly for several trial issues, the new and very slick Science Digest magazine is now a monthly. The quality of the writing, illustrations, and layout is marvelous. There is a wealth of articles in each issue, perhaps a dozen or so features, plus the usual departments. This is a magazine loaded with information, but so well assembled, it does not overwhelm you. There is always a feature or two on astronomy by well-known writers like Jastrow and Kaufmann. If there is one general science publication you should read each month, this is it!

Each of these general science magazines has a different style. There is usually very little overlap in their contents; the real science buff will want to subscribe to all of them. Of course, let's not forget the dean of monthly science magazines, Scientific American. The layout and illustrations are rather bland. But the articles, though tending to be fairly technical, are excellent sources of information and insight, since they are written by the scientists who are themselves responsible for the research. You learn about science first hand, rather than through the second hand reports of science writers. Scientific American is readily available on the newsstands.

For those wishing to specialize in astronomy, there are two main magazines on the market. If you want to learn about a wide variety of astronomical news and research, a subscription to one of these publications is essential. The same applies to those getting into amateur astronomy, ie. building or purchasing your own telescope and using it to explore the sky for yourself. Both magazines described below are as much "hobby" magazines for the amateur as they are popularizations of professional research.

SKY AND TELESCOPE

Monthly: subscription $17.50 U.S./1 year, $33.00 U.S./2 years; Sky Publishing Corporation, 49 Bay State Road, Cambridge, Mass., 02238; single copies $1.75, available only by subscription, no local outlets.

Sky & Telescope is not a new magazine. It started in 1950 when two smaller publications (you guessed it!) The Sky and The Telescope amalgamated. S & T has been the monthly bible of amateur astronomy ever since. Most serious amateurs eventually end up subscribing to it - if you don't, you simply do not know what's going on in the world of astronomy. Each month there is always a good mix of articles on professional research and space exploration, often written by the astronomers involved, articles on amateur activities, with good coverage of club news, plus detailed information on the sky-this-month. There are regular columns on telescope making, observing, comet hunting, book reviews, and news notes. The technical level of some artices is fairly advanced - this is not a magazine for the beginner. The illustrations are profuse, but the layout and style is fairly conservative and unexciting, sometimes downright old-fashioned. The information content of each issue is, however, substantial - if you really get into astronomy, this may well be a magazine that you read cover to cover.

ASTRONOMY

Monthly: subscription $19.00 U.S./year; Astro-Media Corporation, 411 E. Mason St., P.O. Box 92788, Milwaukee, WI. 53202; $2.00 per copy; available each month (in some of Halifax's Bookstores) at the Planetarium Bookstore.

Started in 1973, Astronomy has since gone on to become the world's most popular English-language magazine on astronomy. It is beautifully illustrated, superbly laid out, and the articles are well-written in a highly-readable style. Feature articles tend toward general reviews of various fields of investigation, rather than concentrating on details. Astronomy gives you the "big picture". It is ideal for beginners; there are regular departments covering science news, observing hints, telescope equipment, astrophotography, and of course, a run down of celestial events for the month. Astronomy is excellent for "how to" articles aimed at the novice amateur. The photos and artwork are very colorful. The Astro-Media people also put out two spin-off publications - Telescope Making, for those specifically interested in that art, and Odyssey, an astronomy and space magazine just for youngsters 8 - 14.

With all these magazines (and there are others) on the market, anyone who so desires can learn all they want to about science and astronomy. The information is all there - now the problem is keeping ahead of the explosion!

REPRINTED FROM STARDUST (April 1981 - v. 26, no. 3)

(There is more reviews, in the Sept/Oct issue of Nova Notes; see you next month)

Media Review

Road to Mauna Kea

Written and Directed by Wally Cherwinski

Produced by Dumont Film Productions Ltd. for the National Research Council of Canada, The Canada-France-Hawaii Telescope Corporation and the Centre national de la recherche scientifique (France).

Distributed by National Film Board of Canada

16 mm Colour (22 minutes) 1980

Brief Summary

One of the world's largest and finest telescopes sits on the barren tip of Mauna Kea, an extinct volcano on the island of Hawaii. ROAD TO MOUNT KEA, a film produced for the National Research Council, details the telescope's construction from ground breaking to its first dramatic glimpse into space. Canada, France and Hawaii were partners in this project that took over five years to complete.

Although the site is exceptional for astronomers, the mountain climate and rugged terrain imposed many hardships on construction workers. The cinder cone landscape was often chilled by freezing temperatures and gale force winds.

Cameras recorded the observatory's progress as its working parts were put together by the major partners in the project. While workers in France built the massive support and steering mechanism, which moves with the accuracy of a fine clock, optical technicians in Canada were preparing the eyes of the telescope, a 14t main mirror that took three years of painstaking work to complete. One of the best ever made, the mirror could enable the telescope to see both eyes of a person standing 20km away. The whole viewing assembly was harnessed up to a Canadian-built computer guidance system.

Special cameras and detectors are used to record portraits of starlight as observers reach across light years of space to mysterious quasars or to vast clouds of dust and gas in faraway nebulae.

National
Film Board
of Canada

Terminal Plaza Building
1222 Main Street
Moncton, New Brunswick E1C 1H6
Telephone: (506) 388-6101

Regional Office:
1572 Barrington Street
Halifax, Nova Scotia B3J 1Z6
Telephone: (902) 426-6000

1 Market Square
Saint John, New Brunswick E2L 1E7
Telephone: (506) 658-4996

Sydney Shopping Mall
Prince Street
Sydney, Nova Scotia B1P 5K8
Telephone: (902) 562-1171

202 Richmond Street
Charlottetown, P.E.I. C1A 1J2
Telephone: (902) 892-6612

Notes on Equipment

Buying Your First Telescope

Dave Belcher
Edmonton Centre, RASC

Basically, there are three kinds of telescopes available to the budding amateur astronomer, and it is important to know the advantages and disadvantages of each kind before parting with that hard-earned cash to persue your favorite night-time hobby. It is also important to know that *all* telescopes are merely an extension of your own eye. The characteristics of each kind of telescope are what determines its performance. When we speak of telescope "power", we mean the following:

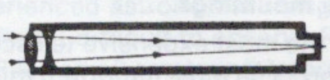
Resolving Power -- The telescope's ability to see very fine detail. This determined by the aperture or diameter of the lens or mirror and by the precision with which the optical components are made.

Light Gathering Power -- This is determined by the diameter of the lens or mirror. A 6inch telescope will gather four times as much light as will a 3-inch scope, and images will look four times brighter.

Magnifying Power -- This is determined by the focal length of the main lens or mirror and by the focal length of the eyepiece used. The *maximum* magnification depends on the aperture, the quality of the optics, the steadiness of the mounting, and on the "seeing conditions" in the atmosphere.

BASIC TELESCOPE TYPES:

Refractors: These use a *lens* as the light gathering element, and have the eyepiece at the opposite end of the tube.

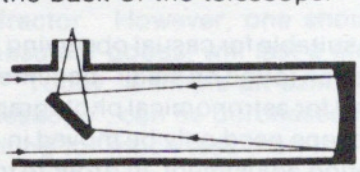


Achromatic Refractor

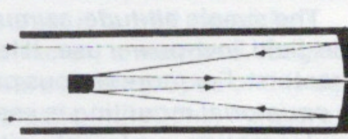
ADVANTAGES -- very sharp images for a relatively small aperture (i.e., good resolving power).....easy to set up and use.....easy to maintain and keep in alignment.

DISADVANTAGES -- images have some chromatic aberration or colour fringing.....less suitable for astro-photography.....very expensive in larger apertures (4-inches or larger).....larger refractors are not portable.

Reflectors: These use a *mirror* to gather light and are made in the basic Newtonian form with the eyepiece on the side of the tube or the Cassegrain form with the eyepiece at the back of the telescope.



Newtonian

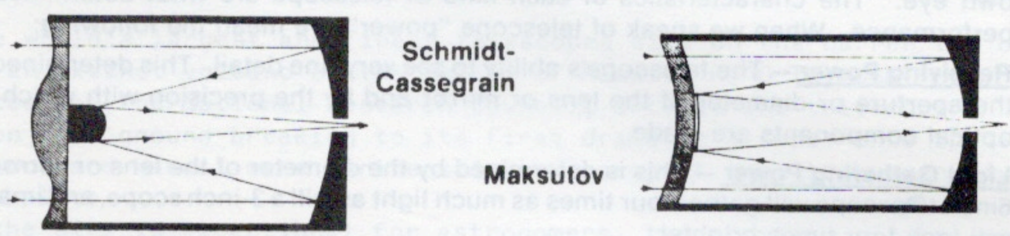


Cassegrain

ADVANTAGES -- for their size they are more portable than refractors.....relatively inexpensive in larger apertures and easy to construct for the amateur....does not suffer from chromatic aberation.....adaptable to astro-photography.

DISADVANTAGES -- not as easy to maintain in alignment as refractors.....short focal length reflectors suffer from coma and consequently have a narrower field of sharp definition.

Catadioptrics: These combine elements of both the refractor and the reflector to produce a very fine instrument. They have a *mirror and a corrector plate or lens.* e.g. Schmidt-Cassegrain and Maksutov designs

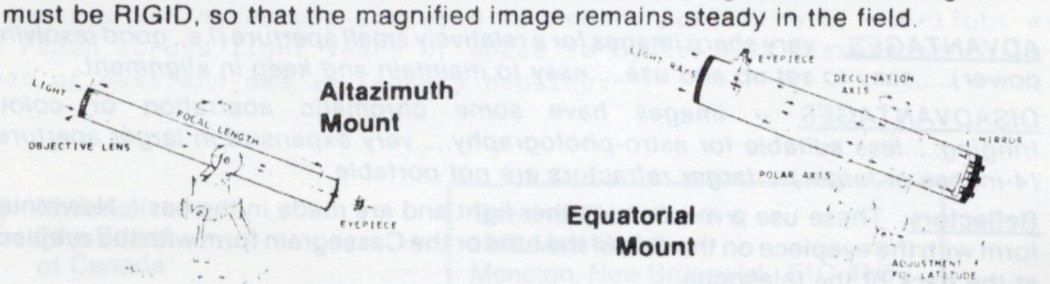


ADVANTAGES -- excellent definition and an exceptionally wide field of view..... The "folded" optical path, even for a relatively long focal length, can be housed in a very compact instrument making them very portable and easy to set up.....easy to adapt to astro-photography.

DISADVANTAGES -- moderately expensive.....difficult to manufacture for the amateur.....large secondary mirror degrades contrast and resolution somewhat compared to an equivalent Newtonian.

And now a word on telescope mountings.....

Even the finest optics on the most expensive telescope will be of little use if the telescope has a flimsy mounting. The most important thing about a mounting is that it must be RIGID, so that the magnified image remains steady in the field.



The simple *altitude-azimuth* type of mounting is suitable for casual observing and wide-field, low-power use. It is the type of mounting often found on small "beginner's" refractors. For more serious prolonged observing, and for astronomical photography, the *equatorial* mounting is essential. With it, the telecope need only be moved in one circular motion, preferably with some sort of fine motion adjustment, in order to track objects during the night. This mounting, to be effective, requires that the observer learn how to align his or her telescope to the North Celestial Pole. Many telescopes over the $300 - $400 price range also come equipped with an electric clock drive which automatically rotates the telescope around its polar axis at the correct speed to follow the sky. This is a "must" for photography of objects other than the moon and sun.

Answers To Commonly Asked Questions

How powerful is that telescope?

The magnification of a telescope is its least important characteristic. Any telescope can be made to magnify at any power simply by inserting the eyepiece of the appropriate focal length. What limits a telescope's performance is its "light-gathering power" - the larger the aperture of the main lens or mirror, the more light the telescope will collect. More light means a brighter, sharper image. Excessive magnification on a given telescope will cause the image to be too dim, very fuzzy and lacking in detail. In general, the maximum magnification for any telescope is equal to 50 X the diameter of the lens or mirror (in inches). Therefore a 2.4-in. refractor can be used up to 120 X, a 6-in. reflector up to 300 X, and an 8-in. telescope at no more than 400 X. However, even with large aperture telescopes, a magnification of over 200 X is rarely required.

How far can you see with that telescope?

This question assumes that faint objects in the sky are necessarily far away and that bright objects must be close by. Unfortunately, in astronomy this is not always the case. Even with the unaided eye you can see the Andromeda Galaxy, an object which is 2,000,000 light years away (provided, of course, you know exactly where to look!) By comparison, even an experienced astronomer using a telescope of say, 25 to 30 cm aperture (10 - 12-in.) will find it difficult to observe Pluto, the very faint planet at the edge of the solar system. Even small amateur telescopes can be used to observe faint galaxies that are often tens of millions of light years away, but this is only because those galaxies are intrinsically so very bright. Therefore, the question should really be reworded as "How faint an object can you see with that telescope?" An 8-inch telescope, for example, can detect objects that are 500 times fainter than what the unaided eye can see.

How much does a good telescope cost?

As with everything else, the price of telescopes has gone up a fair amount in the last few years. Gone are the days when $150.00 would get you a decent 10cm (4-inch) reflector, or for $300.00 you could purchase a equatorially mounted 80 mm (3-inch) refractor. However, one should keep in mind that a telescope, unlike most other consumer goods, will last a lifetime (provided, of course, it is well cared for).

Today, a simple alt-azimuth 60 mm (2.4-inch) refractor, a standard "beginner's telescope", can be purchased for about $175.00. Beware of telescopes of this design selling for much less than this as they may only be plastic imitations, no more than breakable toys. Look for solid metal and wood construction. In reflectors, a good basic model designed for low power sweeping of the skies is the Edmund Astroscan. While the tube is largely made of plastic, there are almost no moving parts, and short of dropping it onto a concrete surface, it would be very hard to break. It sells for $260.00.

Small refractors and reflectors manufactured in Japan, and of respectable quality, used to dominate the low and mid-price category. But the falling dollar and rising Japanese yen has inflated their price to an exhorbitant level. For example, 80 mm refractors once the mainstay of amateur astronomers, now list at $700 - $800! Therefore, the prospective buyer contemplating spending over $300 - $400 for a telescope would do well to consider a 15 or 20 cm Newtonian reflector from Meade Instruments or Edmund Scientific, both American firms. In the upper price ranges are the Celestron line of "compound mirror/lens" telescopes. Prices start at $695.00 for the C90 (3-inch) scope, or $995.00 for the C5 Schmidt-Cassegrain telescope.

Can I take photographs with this telescope?

Unfortunately, the simplest telescopes such as alt-azimuth refractors and small reflectors, while suitable for the novice observer, are largely unusable for astronomical photography. If you wish to persue astro-photography, an equatorially mounted 15 cm Newtonian reflector with an electric clock drive is the minimum requirement. Better yet consider a Celestron 5 telescope, or its larger brother, the C8.

Which is better - a short-focus F/5 or a standard F/8 design?

Often Newtonian reflectors are offered in a choice of focal lengths, perhaps a relatively short-focus, "fast" system such as an F/5 or F/6, or a standard focal length F/8 scope. The F/5 system is better suited to deep-sky observing and astro-photography due to its wider field and lower magnification with any given eyepiece. The F/8 design is better suited to lunar and planetary observing but is a good general purpose focal length. Which is best for you depends on your observing interest. The short F/5 focal length is much more portable; this may be the most important consideration since the capability of easily transporting the telescope to the country for dark skies is essential for good observing and photography.

What can I expect to see with a telescope?

Even a small 60 mm refractor has sufficient light-gathering power and resolution (remember, magnification is not important!) to show the craters, mountains and valleys of the moon, the moons and cloud belts of Jupiter, the rings of Saturn (at least when they aren't "edge-on" as they are in 1980) and the more prominent star clusters. However, telescopes of larger aperture are able to show fainter deep-sky objects such as nebulae and galaxies, and will reveal far more detail on bright objects like the moon and planets. More sophisticated telescopes also feature such things as sturdy equatorial mounts, manual slow motion controls, and electric drives, items which make photography possible and observing far more convenient. With telescopes of apertures of 100 mm (4-inches) or larger, there are a wealth of objects within reach. How much use a person gets out of a telescope depends very much on whether he or she is willing to learn how to find these objects. A good set of star charts and observing handbooks is essential, teamed up with a familiarity with the constellations.

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Notes For Authors

Nova Notes (Bimonthly Astronomical Journal) is a Halifax Centre Publication, intended to promote amateur astronomy in Atlantic Canada. The Centre serves the needs of amateurs in Nova Scotia, New Brunswick and Prince Edward Island. Although the Centre is based in Halifax, members are found situated in all three provinces.

Articles submitted by Halifax Centre members (including parts of N.S., N.B. and P.E.I.) will be given first consideration for the publication. This publication does not limit itself to papers submitted by members in this region. Other papers that are published in RASC newsletters across the country, that are related to amateur astronomy will also be given consideration.

Nova Notes is just not your average newsletter for notices of meetings, observing sessions and detailed minutes of meetings.
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Our publication does not focus on one aspect of astronomy, rather a broad view of astronomical topics are presented to our membership.

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Articles that have lengths less than a page will be placed under a section (ie. Notes from Observatories, Observing Notes, etc.) If you should have enough items to complete a page and are able to type them, contact the editor. Once when members have the handout and the correct procedure to submit articles ready for publication, the task of preparing Nova Notes will be simple for all (including myself). I will not print doubled column pages (that is Glenn's decision for the Nov/Dec issue of Nova Notes).

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Deadline for regular papers is August 12th, Education Notes and Notes From Observatories is August 15th, and all other papers must reach the Editor by August 20th.

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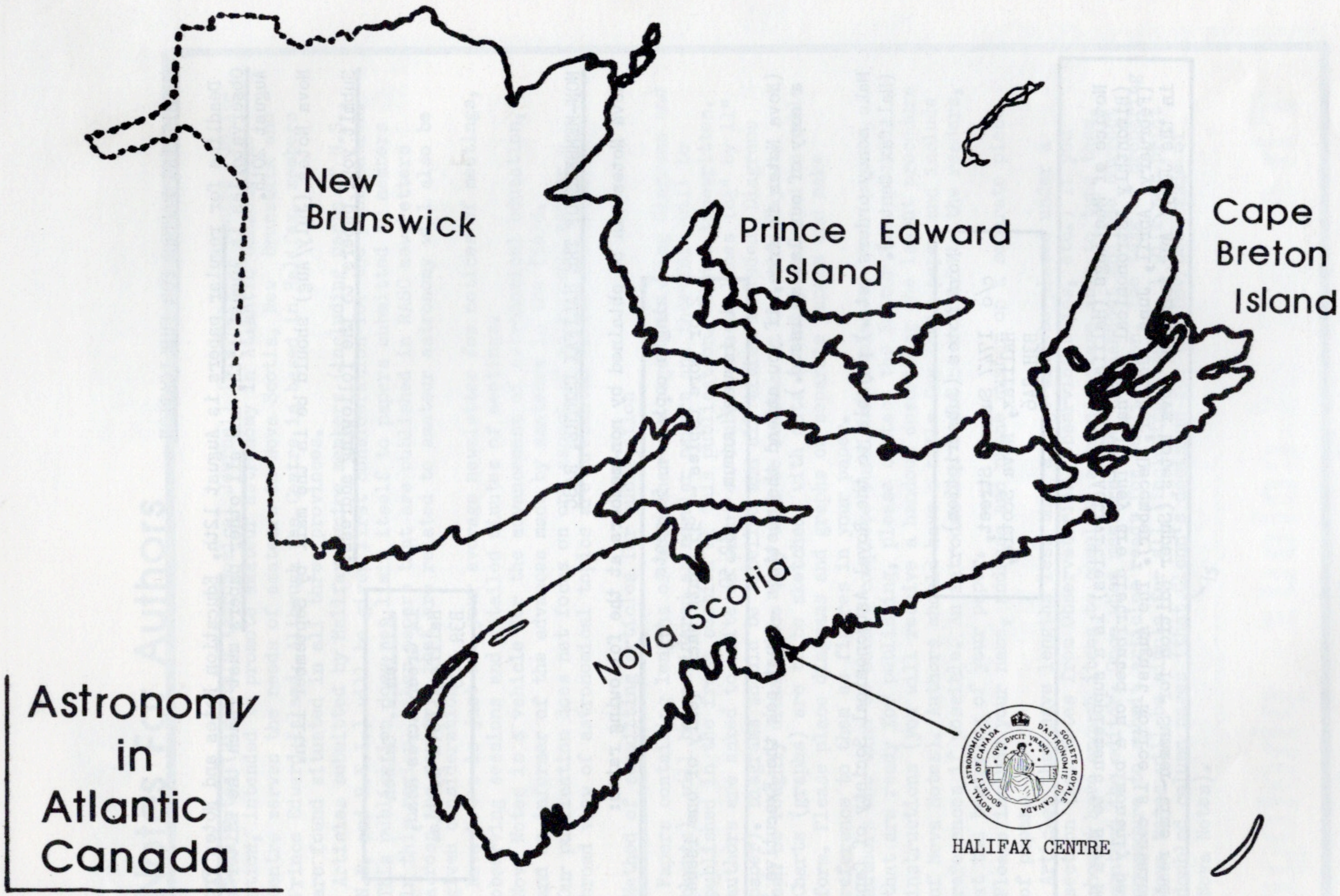

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