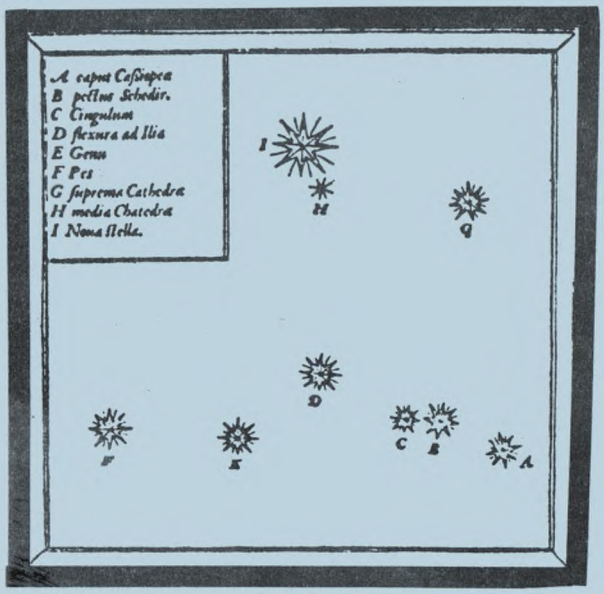
NOVA NOTES



Halifax Centre

Jan-Feb 1986
Volume 17
Number 1

1986 Halifax Centre Executive

Honorary President - Dr. Murray Cunningham

President - Norman Scrimger
12 Lynwood Drive
HALIFAX, N.S. B3M 1Y9

Vice-President - Darrin Parker
c/o Astronomy Dept.
Saint Mary's University
HALIFAX, N.S. B3H 3C3

Secretary - Ralph Fraser
40 Murray Hill Drive
DARTMOUTH, N.S. B2Y 3A8

Treasurer - David Tindall
3231 Glendale Road
HALIFAX, N.S. B3L 3S4

NOVA NOTES Editor - Patrick Kelly
2 Arvida Avenue
HALIFAX, N.S. B3R 1K6

National Rep. - Doug Pitcairn
13 Ferguson Road
DARTMOUTH, N.S. B3A 4J8

Librarian - David Chapman
8 Lakeview Avenue
DARTMOUTH N.S.

Observing Chairman - Gordon Hawkins
327 Arklow Drive
DARTMOUTH, N.S. B2W 4S1

Mailing Address - Halifax Centre, R.A.S.C.
c/o 1747 Summer Street
HALIFAX, N.S. B3H 3A6

NOTICE OF MEETINGS

Date: Friday, January 17th : 8:00 P.M.

Place: Nova Scotia Museum: meeting to be held in the lower theatre. Access from the parking lot and side entrance.

Topic: Terry Deveau will be giving a talk on the subject of nuclear syntesis.

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Date: Friday, February 21st : 8:00 P.M.

Place: Nova Scotia Museum: meeting to be held in the lower theatre. Access from the parking lot and side entrance.

Topic: We will have be having 2 speakers at this meeting:

Graham Millar will be talking on Ancient Egyptian and Babylonia astronomy.

Hugh Thompson will be speaking on a topic which was not yet finalized.

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NOTE: The above list is tentative and subject to change.

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About the cover: The cover this issue shows Tycho Brahe's drawing of the supernova of 1572. The appearance of this "new" star challenged the assumption that the stars were unchanging. From De Stella Nova, 1573

ZEN AND THE ART OF DEEP SKY OBSERVING

The young student approached the Old Man standing by the telescope and broke the silence, "Tell me Wise One. Why are we out here in the cold of the winter night? What is there to learn from staring at faint ill-defined objects in the night sky?" The Master moved away from the eyepiece and let his gaze settle on the student. The MAster was a picture of serenity, at peace with Himself, one with the World. He turned to the telescope once more and pointed it in another direction without looking at the sky or thought the finder, stepped back by a camera tripod and waited. The student stood and waited, shivering in the cold. He finally realized that his Teacher wanted him to look through the telescope and perhaps report what he saw. He stepped up to the eyepiece and stared, gritting his teeth because of the cold. Unimpressed, he glanced at the Master, "I cannot see anything". The Master picked up the tripod, folded it up and whacked the student on the shoulder. The student fell to the snow covered ground in a fit of pain. He dared not cry out for fear of what the Master might do. The Master stood still and waited peacefully, with the tripod standing by his side. The student picked himself up and favoring his bruised shoulder, he brushed the snow off his garments. He stood by the telescope staring at the Old Man. The Master stepped towards him. The student closed his eyes and braced himself, expecting another blow. The Master reached out and gently grasped the tube, nudged it slightly, then stepped back by the tripod and waited as if he expected to be there for an eternity. The young student breathed a sigh of relief. He glanced at the telescope, then back to the Master, then back to the telescope. He looked through the eyepiece. The cold, the pain in his shoulder and the fear of further retribution sent his mind reeling. He found concentrating on what was in the eyepiece very difficult. With frustration in his eyes, he glanced at the Old Man. The Master picked up

the tripod, folded it up and whacked the student's other shoulder. The student fell to the ground in agony. It was a few minutes before the student came to his senses and stood up. The Master nudged the telescope once more and stepped back, standing peacefully by the tripod. The student looked up and for the first time, saw the sky through untainted eyes. The shock of being struck again cleared the clutter that was his mind. The numbing cold, even the pain in his shoulders no longer tormented him. He stepped up to the telescope and looked through the eyepiece. He could see the object that his Teacher had kept in the telescope and centered his awareness on it. He didn't notice his hand nudging the tube to keep the faint, tiny nebula in the field of view.

Peter Ceravolo
reprinted from "Stardust"
Edmonton Centre

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HALIFAX CENTRE TELESCOPE

In December, a magnificant opportunity presented itself to the Centre when several members of the Executive were informed by Glenn Roberts that a store downtown had just put up for sale a like-new, fork-mounted, clock-drive Celestron C8 for only $1200! Randall Brooks thought that since we had the funds available, we should purchase it as a telescope to be used by the members of the Centre. After a little worry over it having already been sold, we were there the first thing next morning to pick up the orange instrument. The new telescope was on display at our Christmas Party in December and the executive is currently working out a procedure for loaning this fine instrument out to interested members. We should have something in place very soon, so keep your eyes open for the next issue of NOVA NOTES!

COMET HALLEY TIME CAPSULE

As you already know, the Toronto Centre is compiling a Comet Halley Time Capsule. This time capsule is to contain observations of Comet Halley by members of the R.A.S.C. The capsule is to be sealed at the 1987 General Assembly and opened at the General Assembly of 2062, just in time for the next scheduled apparition of Halley's Comet.

Observations at all levels, from a single naked eye appraisal to astrophotos and photometric reports will become part of this historical collection of information to record the amateur RASCer's contribution to one of the most studied astronomical phenomenon of our century.

A review committee will carefully examine observations submitted to ensure that a cross section from all levels and types of observations are included. Those whose observations are included will receive a certificate confirming this fact. All members are called upon to submit their own personal observations as well as group or centre activities. You may send your observations directly to the Toronto Centre or phone them in to Mr. Kim Rowe at (416)-482-1427.

It is recommended, however, that you send (or report) your observations to Darrin Parker at any regular meeting or send them in to our Summer Street address (see the front inside cover). By doing this we hope to be able to send the Halifax Centre's observations to Toronto in one or two batches. This would make the job of collection much easier on everyone involved.

"We have an opportunity of leaving our mark on a future generation of amateur astronomers and provide them with some insight as to how it was in 1986. We must not let this possibility escape us" - K.G. Rowe

Darrin Parker

EARLY CHINESE SOLAR OBSERVATIONS

I have just received a letter from Dr. Xu Zhen Tao. He is going to attend the upcoming International Astronomical Union colloquium in New Delhi, India. I understand that Dr. George Mitchell from Saint Mary's University is attending this colloquium as well. Perhaps they will get a chance to meet each other. Dr. Tao has sent me a preprint of his paper and it is most interesting.

He is talking on works of art of the Han Dynasty (200 B.C. to about 200 A.D.) which reveal interesting points about solar phenomena. There were pictures of the sun with a crow represented on the face of the sun (Figure 1) and one crow even had three legs (Figure 2). A reasonable conjecture is that these are sunspots.

Even more fascinating was another picture of the solar disc with a crow flying in the proper direction of the rotation of the sun and just below it there is a little bird (Figure 3) which Professor Xu thinks must be a solar flare, which on rare occasions can be visible as a red spot.

Then we come to eclipses and there is a picture again of the sun with wings and a tail coming out of it, and in front of the sun there is a representation of the moon (Figure 4). I consider this to be quite revealing as the next picture (Figure 5) shows the full solar eclipse of May 28th, 1900, with a tremendous solar corona.

Dr. Murray Cunningham

Editors Note:

Please see the following two pages for the figures referred to in Dr. Cunningham's article.

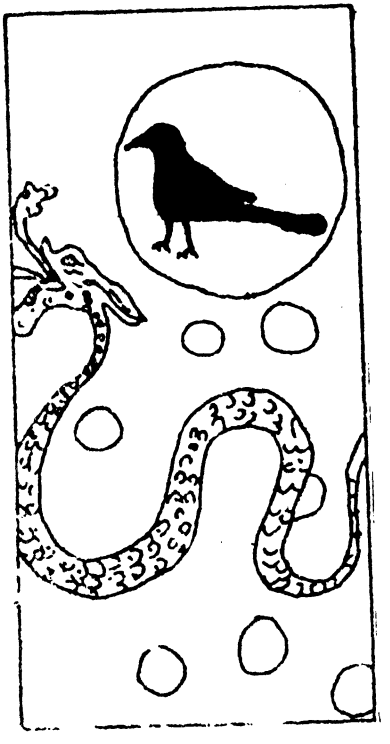


Figure 1

Figure 2

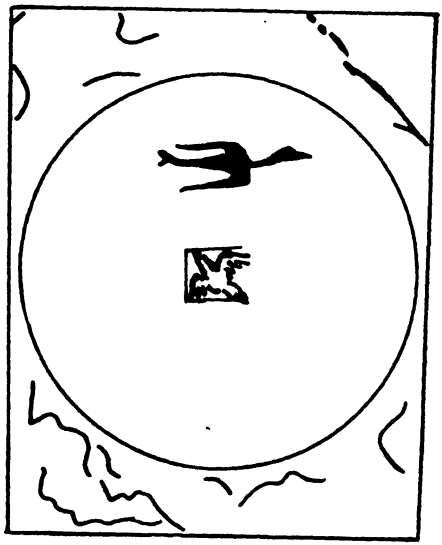


Figure 3

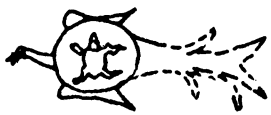


Figure 4

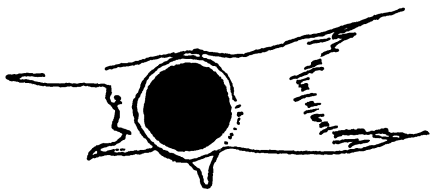


Figure 5

THE GIACOBINI-ZINNER MISSION

With all of our minds trained and eyes focussed on comet Halley it is no wonder that a recent space flight success has gone by unnoticed. On Sept. 11 the U.S. International Cometary Explorer (ICE), originally launched as a solar wind monitoring vehicle, made the first direct exploration of a comet. A few longstanding questions were answered but many new ones were raised and our distant view of comets has changed. Closer observation has revealed that the thousands of comets that wander through our solar system are far more complex and dynamic than previous studies have indicated.

After serving faithfully for seven years the ICE craft was diverted accross the vastness of space to make a twenty minute encounter with comet Giacobini-Zinner. Although the spacecraft was not equipped with an imaging system its onboard apparatus was sufficient to provide a wealth of information. Since this was the first physical encounter of a spacecraft with a comet scientists could only speculate what effect this might have on the probe.

Before this mission scientists had no accurate data on the dimensions of the comet's coma/tail area. After ICE had flown through it at 72,000 kmh it was found to be about three times as wide as had been previously predicted. Another startling discovery made by the instrumentation indicated that the comet was not symmetrical. The space craft passed through about twice as much cometary material upon exit as it did on entry. Although a passage through the tail had been the original goal the space craft actually penetrated 1,600 kilometers closer to the 2.5 km diameter cometary nucleus than had been planned. It was feared that the frail structure of the probe might not survive the cometary environment, however the 90 meter antennas were not sheared off by cometary dust particles nor were the solar cells covered to reduce available electrical power.

One of the primary objectives of this mission was to determine if the comet had a bow shock wave. This is very much like the shock wave produced by high speed missiles operating within the Eart's atmosphere. In space the bow shock wave, if it does exist, should be pushed well ahead of the comet as it encounters the solar wind. Despite obtaining all the necessary data this question has not fully been answered. There does seem to be some dynamics taking place where the bow shock wave should be but it is not the same as those found around planetary bodies.

The surprise of the mission was that comet Giacobini-Zinner is not just a "dirty snowball" but rather an extremely active object. Instrumentation indicated that as ICE approached the comet at a range of 120,000 kilometers it encountered turbulent conditions. These subsided as the craft moved closer to the comet and were replaced by a region of hot, fast plasma of about 500,000 degrees K. However once into the cometary material these temperatures dropped to less than 10,000 degrees K, indicating that the speed of the plasma dropped off dramatically here.

The result of these findings is that comets react very strongly with the solar winds creating what may be some form of a bow shock wave. The coma seems to be a very dynamic cometary envelope and the tail is certainly a region of higher density and activity than had previously been thought.

Another mission to a comet, other than Halley, is planned for 1995 when it is hoped to return a sample of comet dust from comet d'Arrest. Launched in 1992 this vehicle would collect solar data on the way out and be recoverd in 1995 by the space shuttle or a maneuvering vehicle deployed by the planned space station. Comets may only be hazy and infrequent visitors but they are slowly giving up their secrets to enrich our knowledge.

Peter Steffin

PROOF POSITIVE OF GRAVITATIONAL WAVES
"The Binary Pulsar PSR 1913+16"

Most of us are familiar with electromagnetic waves, such as radio waves, which are produced by the oscillation of electrical charges in a wire we call an antenna. The waves are the result of the changing electric field as the electric charge moves back and forth. The frequency of the wave will be just the frequency of oscillation of the electric charge in the antenna. An important property of the wave is that it carries energy with it as it propagates away from its source. Hence, to keep the electric charges oscillating, energy must be put into the antenna, otherwise the charges would stop moving, even if the antenna had absolutely no electrical resistance.

Now, masses such as a tennis ball, a planet or a star have gravitational fields. If we oscillated any of these back and forth, we should get a gravitational wave generated in the same way that an electromagnetic wave is produced by the motion of an electric charge. One difference is that the frequency of a gravitational wave is twice the frequency of the oscillation of the mass producing it. This was first predicted by Einstein in 1916, but to this day no one has been able to detect a gravitational wave. In contrast, Maxwell predicted electromagnetic waves about 1862 and Hertz first detected them in 1887.

Do gravitational waves really exist? After all there are flaws in our analogy. There are two opposite electrical charges (positive and negative), but only one type of gravitational mass. In addition, the gravitational force and thus gravitational waves are very much weaker than electromagnetic force and its associated waves. Many sophisticated and very sensitive gravity wave detectors have been operating, some for as long as 30 years, and none have detected waves from any of the rapidly moving stellar masses in our universe. But, yes, they do exist, and the first experimental proof came from observing a binary star system 16 000

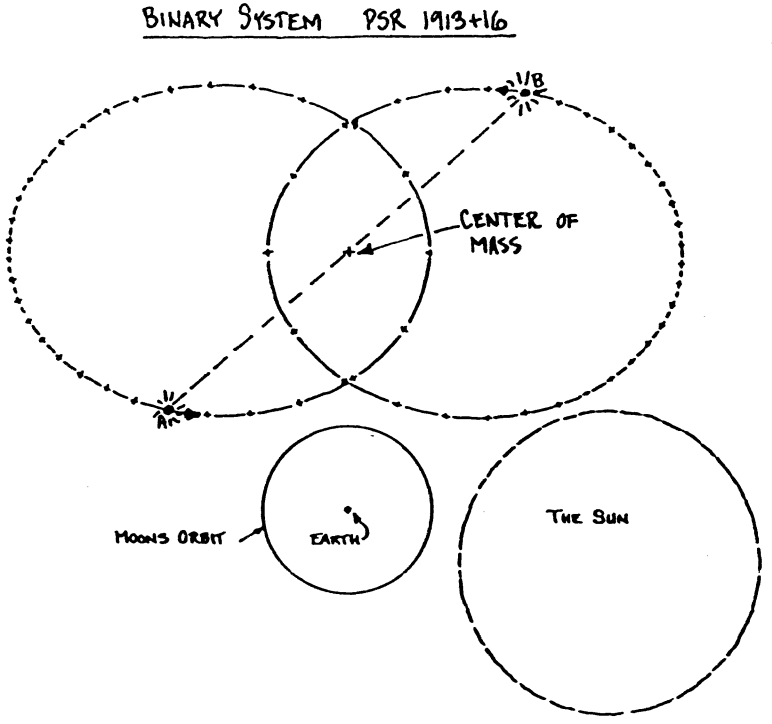
light years away.

In 1974, Hulse and Taylor discovered the first binary pulsar, PSR 1913+16, and by 1978 analysis of the orbital period of the system, showed that the system was slowly losing orbital energy. Analysis of the pulsar signal has enabled us to develop a pretty clear picture of this binary system. The pulsar signal has a period of 0.059 seconds and comes from a neutron star with a diameter of about 10 km. Both stars have masses of 1.4 solar masses, and they orbit each other every 7.75 hours with a mean separation of 0.013 astronomical units (1 943 000 km). The eccentricity of the orbit is 0.617 which means that at periastron (separation 744 000 km) the stars are moving in their orbits at 450 km/s while at apastron (separation 3 142 000 km) they are moving at 106 km/s. Compare this to the orbital velocity of the Earth which is 30 km/s. The accompanying diagram shows the size of the pulsar system compared to the Moon's orbit and the Sun's diameter.

Why is the period of the orbit decreasing? It could be tidal interaction of the neutron star with an ordinary stellar companion, but the advance of the position of periastron would be larger than that measured for the system. A white dwarf companion would give a periastron advance of the same magnitude as that observed, but if the other star were a white dwarf it would produce stellar winds larger than those observed. Thus the conclusion is that the companion star is either a black hole or another neutron star both of which would produce small tidal effects and leave only gravitational radiation as the source for removing orbital energy from the system.

The binary system has three properties that cause it to emit significant gravitational radiation. The masses of the objects involved are large, their orbital period is small and the eccentricity of their orbits is large. If the period was one year as is the case for the earth, the amount of gravitational radiation would be reduced by a factor of 125 000; if the

orbits were circular, the reduction would be by a factor of 11.8 and if the masses were that of the sun, the reduction is by 1.75.



General Relativity predicts a decrease in the orbital period of the system of 0.067 microseconds for each orbital period. That is a change of 2.4 parts per trillion and is what is measured (i.e. well within experimental error). Therefore, gravitational energy could be causing the orbital energy loss. Not content with this triumph, Weisberg and Taylor (1984) measured and analyzed the binary pulsar so precisely that they were able to detect the excess delay (25 microseconds) of the propagation of the pulsar signal caused by its passage through the gravitational field of its companion. Their results were consistent with a compact companion star and leaves no doubt that this system emits gravitational radiation.

The system is so intriguing that it is interesting to look at it more closely. The advance of periastron is 13.5 seconds of arc per revolution compared with the advance of perihelion of Mercury which is 0.10 seconds of arc per revolution. In other words, this is 422 degrees per century compared with 43 seconds of arc per century. The gravitational radiation is being emitted at a rate equal to 1/50th of the luminous output of the Sun. Although PSR 1913+16 is not the fastest pulsar, it is one of the faster ones and the neutron star rotates 17 times a second giving an equatorial surface speed of about 600 km/s.

Larry Bogan
Cambridge Station

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ASTRO ADS

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For sale: - 8" reflector
- f/6
- optics by Meade
- altazimuth mount
- 1-1/2 years old

Phone: Mark Walker (902) 543-8564

==========

For sale: - Celestron Super 8 fork mount
- clock drive motors
- suitcase
- like new
- cost new $1200
- selling for $500

Phone: Don Gauguin (506) 382-6573

CHINA PREPARES FOR HALLEY'S COMET

Halley's Comet, an old familiar to Chinese skywatchers, approaching the Earth at 5.5 kilometres per second in its regular 76-year orbit, will find China's astronomers well prepared to study it.

In November it will be observable with binoculars in the northern hemisphere, in December with the naked eye. In mid-January it will be at its brightest, though low on the horizon. By the end of that month it will be in line with the sun and difficult to see. In the southern hemisphere the best observation will be in March. It will gradually fade from sight in May, though observatories will be able to track it until August. The comet's next visit will be in the year 2061.

Though Halley's Comet was named after British astronomer Edmond Halley (1656-1742), its appearance was first recorded in China at least 3 000 years ago. In 1057 B.C. the writings Huainanzi stated that "King Wu fought for the throne of King Zhou, and the comet appeared". In 613 B.C. the Spring and Autumn Annals noted that "in the seventh month of the year the comet shone brightly near the Plow" (a constellation). In 467 B.C., its reappearance was again described. However, these records were simple and dates are disputable.

The world acknowledges the first reliable record of the comet as the one reported in Sima Qian's Records of the Historian: "In the seventh year (of the reign of Emperor Qin Shi Huang) a comet appeared first in the east and then in the north. In the fifth month it appeared again in the west". This was 240 B.C., 228 years earlier than the first record of the comet made by the Romans. The appearance that the Romans sighted was also recorded by the Chinese but in greater detail, including data on the comet's orbit. In the 2 000 years between 240 B.C. and 1910, Chinese astronomers recorded all 29 visits of Halley's Comet - accumulated data of the highest value to world scientists.

There are many records of Chinese observations of other comets. From a Han dynasty tomb in Mawangdui, Changsha, Hunan province, 29 paintings of comets on silk were unearthed in the 70s. Dated at no later than 168 B.C., they are the worlds earliest astronomical pictures. China knew 1 000 years earlier than Europe that comets have no light of their own. The astronomy section of the History of the Jin Dynasty (A.D. 265-420) records that "comets produce no light. They only reflect that of the sun." This fact was appreciated in Europe only in 1513.

The return of Halley's Comet this year is being observed with greater scientific scope and precision than ever before. The International Astronomical Association has organized both professional and amateur astronomers into a worldwide ground observation network. Chinese astronomers are members of its observation guiding group.

Since 1982, China has held three meetings to prepare for observations of the comet. Eleven areas of study have been assigned to the observatories in different parts of the country. On November 4th, 1984 the Yunnan Observatory in the south was the first to observe Halley's Comet as it approached our solar system on this trip.

Training classes, study sessions and summer camps have been organized throughout the country to teach young people about the comet. Participants in Beijing and Shanghai took part in a Halley's Comet quiz. In Guangdong they made 2 000 simple telescopes. All observation activities in China are being guided by a national organization.

submitted by Murray Cunningham
reprinted from "Constructs"
November 1985

GAWKER'S REPORT

Time: Thur. Dec. 5 / 85
Place: Halifax Radio Control Flying Club site,
Upper Beaverbank
Present: G. Roberts, D. Pitcairn, P. Kelly
M.V.M.(Minimum Visual Magnitude): 5.5
Weather conditions: calm, high cloud moving in later
Equipment: C8, B&L4000, 20X80 & 10X50 binoc.
Objects observed: Our first sighting of tail of Halley's Comet;M33, M82, M83, M46 (Beehive), M31,M32 & M110

This site has good potential as a dark accessible spot with a 360 Degree horizon, no visible house or street lights and a flat, level mowed grass field complete with a paved area. It is also about the same distance from Halifax as Mount Uniake.

Time: Dec. 1, 9, 10, 11 / 85
Place: Arvida Avenue, Halifax (Spryfield)
Present: Pat Kelly
M.V.M.(Minimum Visual Magnitude): 5
Weather conditions: clear, seeing good on all dates except the 11th
Equipment: 20X80 binoculars
Objects observed: Comet Hartley-Good

This comet was considerably smaller and fainter than Halley's as both were observed on each occasion. Without a good star map and ephemeris, it would have been very difficult to find Hartley-Good, not only because of its appearance but also because it was very low in the west and had to be observed from an "urban" site.

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compiled by Doug Pitcairn

There seems to a gap in the astronomical history of most people, who are able to explain what was going on in the astronomical community up to the time of Newton and after Einstein, but not for that nebulous period in between. If you wish to brush up on your 1800's astronomy, I heartily recommend "The Astronomical Scrapbook" by the late Joseph Ashbrook. This book consists of a collection of close to 100 of Ashbrook's bi-monthly columns from Sky & Telescope, some going back to the 1950's. As Ashbrook died just after beginning this work, it was left to Leif Robinson, with whom he had been collaborating to finish up the work.

Ashbrook's interest in ferretting out interesting pieces of astronomical interest led him into many diverse areas. A few of the questions which are answered in this book are: How rockets were used in astronomy 200 years ago; Who tried to build the world's largest observatory and killed himself when he failed; Which astronomer built an automobile generations before Henry Ford. Other topics covered include such areas as the great Paris telecope fiasco; comet hoaxes; lost asteroids; the biggest amateur telescope ever made; etc.

The book is divided into several sections, dealing with, in turn, astronomers lives, telscopes and observing techniques, phenomenoa of the planets and the Moon, stars and stellar systems and publications. Since there is some overlap between articles; as they originally appeared over a span of 30 years; whenever a person or event appears in one section that is covered in more detail in another section, a reference is made to the more detailed article.

An appendix included several further references for each article as well as the issue of Sky & Telescope that it originally appeared in. I found the book hard to put down, once I had started it, and I'm sure most of you will find this book the same.

Pat Kelly

GA*ZER


Gazer, I don't know about you, but these clouds coming in look pretty bad!
Come back here you wimps!! Are you afraid of a little cloudy weather?

P. Kelly / D. Pitcairn

NOVA NOTES INDEX

January - February 1986 Volume 17/Number 1

NOVA NOTES is published bi-monthly by the Halifax Centre of the Royal Astronomical Society of Canada in January, March, May, July, September and November. Articles for the next issue should reach the editor by FEBRUARY 21st, 1986. Articles on any aspect of astronomy will be considered for publication. The editor is:

Patrick Kelly
2 Arvida Avenue
Halifax, Nova Scotia
B3R 1K6
477-8720

NOVA NOTES is printed courtesy of the Nova Scotia Museum

R. A. S. C. - HALIFAX CENTRE 1986 CALENDAR OF EVENTS

January 1986

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			1	2	3	4
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February 1986

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March 1986

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April 1986

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May 1986

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June 1986

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July 1986

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August 1986

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September 1986

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October 1986

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November 1986

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30						

December 1986

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21	22	23	24	25	26	27
28	29	30	31			

Key to calendars:

Meetings **outlined**

Special days **shadowed**

Observing sessions

bold and underlined

Observing session alternates

italics and underlined

Additional Observing sessions:

August 1,2,3,4 camping observing weekend

Meetings:

The 3rd Friday of each month at the N.S. Museum

Meteor Showers:

August 11 is the Perseids (6 - day old moon)

November 16,17 is the Leonids (full moon)

December 14,15 is the Geminids (12 - day old moon)

Banquet will be on a Friday in May - yet to be announced - **watch for it!**

October 1 - 1987 Member slips due.

Halifax Centre
Royal Astronomical Society of Canada
c/o 1747 Summer Street
HALIFAX, Nova Scotia
Canada
B3H 3A6

RASC National Office
136 Dupont St.
Toronto, Ont.
M5R 1V2