

# AURORA

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The Royal Astronomical Society of Canada - Windsor Centre

May 2001



## Edward Emerson Barnard by Florence M. Kelleher

Edward Emerson Barnard was born in Nashville, Tennessee, on December 16, 1857 to a life of poverty and hardship. His father died before he was born. He spent only two months of his early life in school, receiving all of his education from his mother. Forced to help support her, Barnard took a job in a photography gallery when he was nine. In charge of the solar enlarger, a device that tracked the sun to make photographic prints, he became an expert in the techniques of photography.

Barnard's first telescope, a simple lens in a cardboard tube, was made for him by one of his coworkers from the small objective of a broken spyglass found in the street. With it he began observing the stars, but was unable to identify any of them. In exchange for a favor, a friend gave him a copy of Thomas Dick's book, the Practical Astronomer, in 1876. Finding a star map in the book, Barnard was able to learn the conventional names of the objects with which he was already so familiar. From these humble beginnings, he went on to become the greatest astronomical observer of his time.

In 1876, Barnard purchased a 5-inch refracting telescope for \$380, two-thirds his annual earnings, and read extensively on astronomy. When a scientific meeting was held in Nashville in 1887, Barnard met Simon Newcomb, the dean of American astronomers. Newcomb, an expert in celestial mechanics, advised the eager young man to improve his mathematical skills and search for comets.

Although Barnard hired a math tutor, it was hard work at the telescope that allowed him to discover his first comet in 1881 and several more the following year. While earning a reputation as a keen observer, he also earned money for the discoveries in a rather novel way. A wealthy patron of astronomy, H. H. Warner of Rochester, New York, rewarded the discovery of each new comet with \$200. Barnard did rather well. He himself related that the first time he won this purse he and his wife, Rhoda Calvert, decided to use it as a down payment on a house! He then turned to comet hunting with new enthusiasm. Barnard was often teased for building Rhoda a "comet house" with several of Warner's prizes. Good-naturedly, he retorted, "it came about that the house was built entirely from comets. This fact goes to prove the great error of those scientific men who figure out that a comet is but a flimsy affair after all....for here was a house, albeit a small one, built entirely out of them. True, it took several good-sized comets to do it, but it was done nevertheless."

Barnard's growing reputation soon brought him to the attention of officials at Nashville's Vanderbilt University. In 1883, he received a Fellowship to Vanderbilt and graduated in mathematics in 1887. Barnard became a part-time student and part-time instructor, and he was thus able to gain analytic skills while earning a living to support himself and his wife.

Vanderbilt had a 6-inch refractor that Barnard used. By the time he graduated, he had discovered eight comets in all and had made numerous observations that attested to his keen eyesight. He corresponded with several other visual observers, among them S. W. Burnham, with whom he would later work at the Lick and Yerkes observatories, and Edward S. Holden, who was President of the University of California and scheduled to become the director of Lick Observatory when it was finished. Barnard knew that astronomy was his calling and hoped that he could obtain a post through these contacts.

His correspondence with Holden was like that of a "mutual admiration society." Barnard had never known his father and often attached himself to older men who could guide him and offer encouragement. Holden had a great ego and thought he was destined for greatness. He enjoyed Barnard's fawning letters. In 1887, before he had the authority to begin hiring staff for Lick Observatory, Holden asked Barnard for a resume to present to the University regents. Barnard listed all his discoveries: ten comets and twenty-three new nebulae, as well as his good habits: "I am perfectly temperate, neither smoke, chew, nor use intoxicating drinks."

What Barnard failed to mention was that he was recklessly overeager. Without finding out if the observa-

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# Calendar of Events

## Our next meeting...

Tuesday, May 15, 2001  
8:00 p.m.  
at  
St. Stephen's Church  
Howard Road, 1.4 kms. south of  
Hwy # 3

## Main Speaker...

Robert Garrison

## Topic...

"The Process of Discovery:..."

## Activities...

**Lyrid Meteor Shower** - Peak the night of Saturday April 21/22. The Moon is near new so this year should be a good show

**Earth Day** - Sunday April 22nd at Ojibway Park. Noon - 4:00 p.m. with setup at 10:00 a.m.

**Eta Aquarid Meteor Shower** - Peak the night of Friday May 4/5. The Moon is near full so this year is less than favourable

**Council Meeting** - Tuesday June 12th at Randy Groundwater's house. Meeting begins at 7:29 p.m.

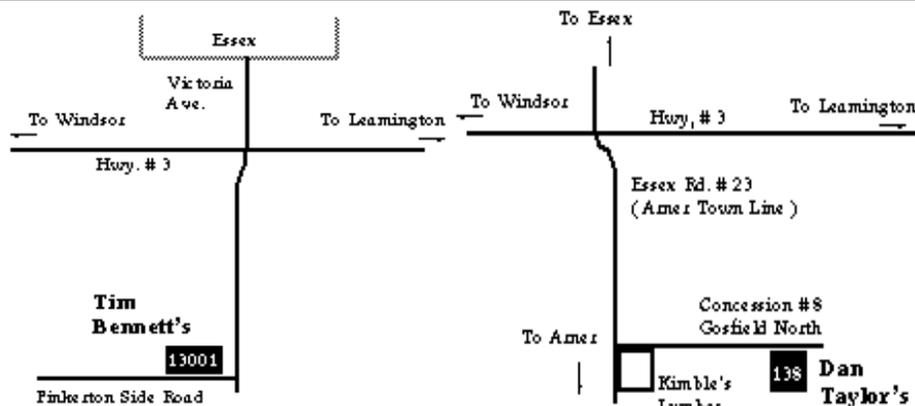
## Observing Nights

**Frank Shepley's**.....Last Quarter Moon

**Dan Taylor's**.....New Moon

(please call before showing up)

## Maps



Tim's House (776-8901)

Dan's House (776-4493)

## Calendars

Windsor Centre members who wish to purchase the 2001 RASC calendar should buy it through Frank Shepley for \$12.00. Not only will you save a couple of dollars but the Windsor Centre will also get a portion of the proceeds. See Frank at any meeting to get your copy.

## Submissions

Aurora is published monthly except for August. The September, November, January, March, May and July issues are full newsletters (usually 6 pages) with a number of member submitted articles. The October, December, February, April and June issues are short flyers (2 pages) with one short article. Submitted articles can be of any length from a paragraph to multiple pages. I can scan pictures and/or diagrams (both prints and film) to support your article and the originals will be returned to you.

Submission deadline is the 1st of the month. I will accept Emails at the address below, floppy disks, or written submissions.

Editor: Steve Mastellotto

Email: smastell@wincom.net

## Membership

The Windsor Centre of The Royal Astronomical Society of Canada meets on the 3rd Tuesday of every month (except July and August) at St. Stephan's church. In addition to regular meetings the centre hosts a number of observing nights, a picnic and a December social. Members receive a copy of the Observer's Handbook, the RASC Journal, a subscription to SkyNews magazine and access to the Centre's library and telescopes.

Membership is \$40.00 - 1 year, \$80.00 - 2 years and \$120.00 - 3 years. Life memberships are also available.

Contact Frank Shepley at (519) 839-5934 or visit our website at: [www.mnsi.net/~rasc](http://www.mnsi.net/~rasc) for more information.

## Barnard (continued)

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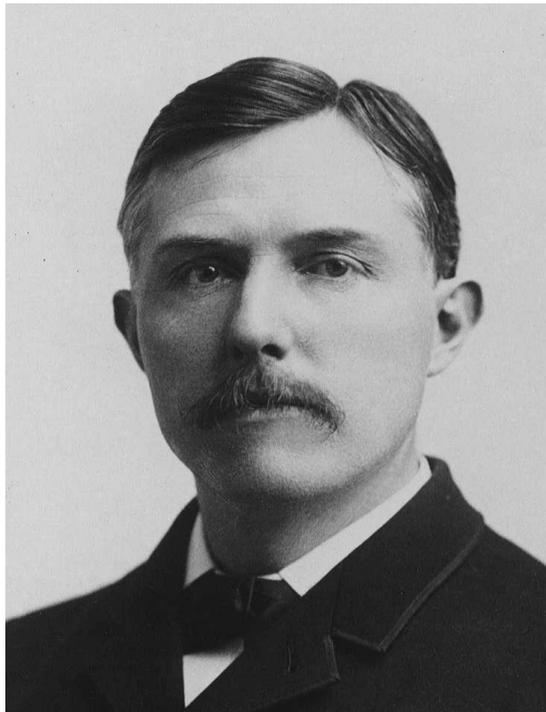
tory was ready or not, he quit his job at Vanderbilt and began selling his home and possessions. When Holden wired him to delay his arrival, Barnard said he could not, but that he wouldn't mind working at Lick for a short while without a salary. He and his wife arrived in California in September, 1887, and were forced to rent a room in San Francisco for almost a year. Holden found him a job as a clerk in a law office until Lick was ready for him to move there.

While waiting for the observatory to near completion, Barnard met other new staff including James Keeler, Burnham, and John Schaeberle. In the spring of 1888 the Lick trustees offered him the job of inventorying the property of the observatory. He moved to Mount Hamilton for a few weeks. While doing inventory by day, he had the chance to observe on the 36-inch telescope at night with Keeler. Barnard was burning with desire to begin observing and serious research.

After Lick Observatory began operating later in 1888, Holden assigned himself, Burnham and Keeler each two nights a week on the 36-inch telescope and left one night for the public. Barnard and Schaeberle had to share the 12-inch telescope in the smaller dome or use their own. Holden planned to produce a lunar atlas with his photographs of the Moon and enlisted Barnard as his helper. With his extensive knowledge of photography, Barnard was assigned to develop Holden's pictures. Barnard was disgusted at the poor quality and lack of focus of the pictures, and he saw Holden's time on the 36-inch as a waste of valuable observing time.

In spite of the menial tasks assigned to him, and his inability to get time on the 36-inch, Barnard took advantage of any opportunity to prove his exceptional observational skill. When a cheap 6-inch wide-field lens was purchased for Lick, he demonstrated its potential for astronomy, and it was sent to optician John A. Brashear in Pittsburgh where it was converted from its original use as a portrait lens to an astronomical tool. When it came back, Barnard rigged up a wooden box camera, and with the crudest equipment began photographing comets. He showed that comets could be tracked from night-to-night by photographic means. In 1892, while developing his photographs, Barnard saw that he had discovered a new comet, the first to be discovered photographically.

Barnard's next field of study, the Milky Way, demonstrated both the power of the wide-field 6-inch photographic lens and his own extraordinary powers of observation, persistence and dedication. The pictures were remarkably clear - showing the structures of lanes, dark holes and gaps, and sprays of faint stars as no other pictures ever had. The work required that the telescope be guided precisely to follow the field across the sky, unwavering, for several hours, a concentration guaranteed to strain eye, mind, and body. His final success was a tribute to his skill as a photographer and disciplined astronomer.



This magnificent work earned Barnard the Gold Medal of Britain's Royal Astronomical Society in 1897. During the presentation in London, it was noted that: "We must certainly admire, not merely the skill, but the courage of a man who could, under the very shadow of the great 36-inch refractor, demonstrate the merits of a lens which could be bought for a few shillings." This was, indeed, high praise for Barnard.

In addition to discovering comets and photographing the Milky Way, Barnard turned his attention to Jupiter. Using the 12-inch telescope, he observed its closest satellite, Io, and noticed two darkish blips and an elongated white bar as the moon crossed Jupiter. After further observation, he concluded that Io must be light in color along its equator and dark at its poles. Modern observation has confirmed his findings, but "the fact that he could discern surface features on the distant, tiny moon indicates the high quality of his eyesight and his concentration at observing."

In 1892, S. W. Burnham left Lick and Barnard appealed to the regents for his time on the 36-inch telescope. Three months after he was granted this request Barnard proved his qualifications by discovering the fifth moon of Jupiter. This discovery stunned the world, for the first four moons of Jupiter had been discovered by Galileo in 1610. None of the hundreds of astronomers looking at Jupiter had seen the fifth moon until Barnard turned his keen eye and the power of the 36-inch refracting telescope on the planet. Barnard's discovery, named Amalthea, turned him into a national celebrity.

Barnard would have been content with his work and celebrity had it not been for the deteriorating relationship with Holden. Holden's ability to take credit for everyone else's work while producing poorly himself gradually turned the staff against him. For Barnard, Holden's response came in the form of demeaning and belittling assignments and culminated in Holden's refusal to publish his Milky Way photographs. When an offer came in 1895 to join the faculty of the University of Chicago as a Professor of Practical Astronomy working at the new Yerkes Observatory, Barnard took it.

Once again an overeager Barnard arrived at his next job before the observatory or his house was built. He lived near the Kenwood Observatory in Chicago for almost a year, working on the photographic plates he produced at Lick Observatory. In the course of reviewing his photographs, he often found new paths for investigation and measurement, which formed the basis of his future research. He continued to study comets, nebulae, faint stars, and the Milky Way galaxy, refining his measurements with each new observation. He participated in several expeditions to observe solar and lunar eclipses.

In preparation for the opening of Yerkes Observatory, Barnard worked with Hale and Burnham in 1897 to test the new 40-inch refracting telescope against known results produced by the 36-inch telescope at Lick. The resolving power was found to be greater than

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# Asteroids Destroyed Life on Earth at Least Twice by Maggie Fox

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WASHINGTON (Reuters) - Asteroids crashing into Earth have virtually wiped out life not once but at least twice, scientists have reported.

An asteroid or comet roughly the same size as the one that wiped out the dinosaurs 65 million years ago did even worse damage 250 million years ago, experts found in a report published in Friday's issue of the journal *Science*.

The evidence comes from space gases trapped in little carbon spheres called Buckyballs in ancient layers of sediment. They show the Permian extinction event, during which most species on the planet disappeared, started with a cosmic collision.

"The impact ... releases an amount of energy that is basically about 1 million times the largest earthquake recorded during the last century," Robert Poreda, associate professor of earth and environmental sciences at the University of Rochester in New York, who worked on the study, said in a statement.

The comet or asteroid would have to have been 4 to 8 miles (6.5 to 13 kms) across. The jolt roused volcanoes, which buried huge areas in lava and sent up ash to join the dust from the explosion to plunge the world into centuries of unnatural dark and cold.

Trilobites -- strange, cockroach-like creatures that once ruled the planet -- died out completely, all 15,000 species of them. Ninety percent of all marine creatures and 70 percent of land vertebrates went extinct.

"If the species cannot adjust, they perish. It's a survival-of-the-fittest sort of thing," said Luann Becker, assistant professor of Earth and Space Sciences at the University of Washington, who also worked on the paper.

"To knock out 90 percent of organisms, you've got to attack them on more than one front."

The asteroid which wiped out the trilobites was just about the size of an asteroid that left a giant crater on Mexico's Yucatan Peninsula 65 million years ago and wiped out the dinosaurs.

Unlike with the Yucatan impact, the researchers, who included teams from the National Aeronautics and Space Administration and New York University, do not yet know where the giant space object smacked down.

## BUCKYBALLS HOLD THE CLUES

What they did find was a layer of little carbon molecules called buckminsterfullerenes, or Buckyballs. Inside these soccerball-shaped spheres were helium and argon gases.

The spheres, gathered at sites in Japan, China and Hungary, lay at the sedimentary layer put down 250 million years ago, between the Permian and Triassic periods.

"These things form in carbon stars. That's what's exciting about finding fullerenes as a tracer," Becker said.

The gases are isotopes, meaning they have a certain atomic structure, that suggests they came from space, the researchers reported.

They fit in with other evidence found from layers dating back to the extinction. For instance, some of the most extensive volcanic activity ever, in what is now Siberia, laid down enough lava to cover the entire planet with 10 feet (three metres) of rock over a one-million year period.

"It was the proverbial blast from the double-barreled shotgun," Poreda said. "We're not sure of all the environmental consequences, but with both the impact and with the volcanic activity, we do know that Earth was not a happy place. It may be that the combined effects of impact and volcanism are necessary to cause such a tremendous extinction."

But life did come back, giving rise to the rich collection of animals that thrived during the Triassic, Jurassic and Cretaceous periods. Dinosaurs evolved, as did mammals.

"These two extinctions are like bookends for the age of the dinosaurs," Poreda says. "The P/T (Permian/Triassic) boundary helped to usher in the age of the dinosaurs, and the K/T (Cretaceous/Tertiary) boundary snuffed it out."

## Barnard (continued)

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*(Continued from page 3)*

Lick and many new close double stars were discovered. Barnard's observation of a companion star to Vega, while of no great astronomical significance, nevertheless demonstrated the light-gathering power and the perfection of the new 40-inch lens. Only these excellent optical qualities permitted so faint an object to be observed near such a bright star as Vega. Other preparatory work showed that nebulae were viewed with greater clarity, including some which were not visible at Lick.

In 1897, Barnard solicited a donation from Miss Catherine W. Bruce of New York, a patron of astronomy. With a \$7,000 gift to the University of Chicago, the Bruce telescope was built to Barnard's specifications. The instrument consisted "of a five-inch guiding telescope and two photographic doublets of 10 and 6 1/4 inches aperture, rigidly bound together on the same mounting." Brashear made the lenses in 1900, after an unusually long "delay caused by Barnard's anxiety to get...the widest field possible and the shortest relative focus consistent with such a field." The specially modified mounting was provided by the Warner & Swasey, Co. The telescope was

ready for use early in 1904.

A small wooden observatory, 15 x 33 feet, with a 15 foot dome, was built for the telescope, midway between the main building and Barnard's house overlooking the lake. Barnard had the use of the Bruce telescope virtually to himself. With it, and his nights on the 40-inch, he continued his photographic investigation of the Milky Way and comets. For a short period in 1904-05, the Bruce telescope was dismantled and sent to Mount Wilson in California where Director George E. Hale had established a branch of the Yerkes Observatory for solar research. Barnard spent several months at Mount Wilson observing regions of the Milky Way that were not attainable from the latitude of Yerkes Observatory.

Apart from astronomy, Barnard found working at Yerkes a pleasant experience. He liked the young director, George E. Hale, and enjoyed working with his former mentor, Burnham--who would arrive each weekend with a case of Burgundy and a box of cigars! They spent as many weekend nights in the great dome as the weather

*(Continued on page 5)*

## Barnard (continued)

*(Continued from page 4)*

would allow. Burnham, a relaxed and methodical observer, would turn the telescope to the East and search for double stars in his line of sight. If a star moved to the West, he let it go rather than adjust the telescope. When the sky was cloudy, he would sit in a chair, puffing away on a cigar and sipping wine.

Barnard, on the other hand, would run to the eyepiece every time he thought the sky would clear. He was an anxious observer and could not sit still, nor let an opportunity slip away. The atmosphere over Geneva Lake could not match the clear nights on Mount Hamilton, and many nights were lost to the clouds. But Barnard was happy at Yerkes, and remained there for the rest of his life.

Many stories are told about Barnard's tenacious work habits. The dome that housed the 40-inch telescope could not be heated in the winter because the turbulence of mixing hot and cold air would have degraded the image quality. Barnard showed up for work one morning with a raw wound on his face, claiming he was concentrating so hard on his observations that he did not realize his nose had frozen to the eyepiece. Another time, when asked by a visitor how the astronomers kept warm, he replied flatly, "We don't."

In the early hours of May 29, 1897, shortly before Yerkes was scheduled to be finished, Barnard and Ferdinand Ellerman, Hale's assistant, were observing nebulae. Ellerman had noticed a noise at 12:45 am, when he raised the giant elevating floor, but could not find the cause of it. After three hours, he and Barnard left the dome. A few



hours later the thirty-seven and one-half ton floor they had been standing on collapsed into ruins when a cable snapped. Whether Barnard lived a charmed life or not, he seemed always where the action was.

Barnard lived until 1923. The great 40-inch refracting telescope was made for a man like him, eager to observe whenever the opportunity was right. He logged more observing hours on the 40-inch telescope than any other observer. His great work, the Photographic Atlas of

Selected Regions of the Milky Way, was published by the University of Chicago Press after Barnard's death. Much because of his own demanding perfectionism, Barnard was denied the gratification of seeing his photographs published while their novelty gripped the world. Fortunately, their scientific value is timeless and the publication is still in use today.

Barnard was buried in Nashville, Tennessee, his birthplace. A tablet was erected in his memory at the place in the city where he discovered his first comet in 1881. At Yerkes he is still remembered fondly. His home, standing a few hundred feet from the great dome on the banks of the lake, was deeded to the University upon the death of his wife. It has undergone very few changes and is, today, the residence of the current Director.

*This biography is from the University of Chicago web site <http://astro.uchicago.edu/yerkes/virtualmuseum/Barnardfull.html>*

# UNIVERSAL SCIENCE

Windsor's Astronomy And More Store

*We are moving! We still have inventory on most items  
10% off on all in-stock telescope accessories and binoculars*



**NEW! In-Stock** - Skywatcher 8" DOB: 200mm (8") F6 Parabolic Reflector C/W Dobsonian Mounting, metal tube, 2" focuser with 1.25" adapter, 6x30 finder, SMA 25mm and SMA 10mm eyepieces, eyepiece shelf, integrated self balancing system. Suggested List Price ~~\$599~~ *Special Low Price \$499.99*

**NEW! In-Stock** - Meade LX90: 200mm (8") SCT, Computerized full GO TO, 30,000 object library. Mail Order Price ~~\$2,899~~ CDN *Special Price \$2,699 CDN*

Meade 8" f/6 mirror and cell, secondary mirror, 1.25" focuser, 6x30 finder, two eyepieces - MA 25mm and Ortho 9mm, 2x barlow, #12 (yellow) and #80A (blue) filters. You supply sonotube, spider and mount *Price \$200*

Contact Robin Smallwood  
Monday - Friday 9:00 a.m. - 5:00 p.m., Saturday 9:00 a.m. - Noon, Closed Sunday  
Telephone: (519) 967-1655 Fax: (519) 967-1657  
Email: [unisci@sympatico.ca](mailto:unisci@sympatico.ca)

# March Meeting Minutes

## GENERAL MEETING MINUTES

March 20, 2001

*President* - Randy Groundwater called the meeting to order at 8:05 p.m.

President asked the membership to review the minutes from the February 20th, 2001 general meeting.

Corrections to the previous minutes were brought forward for correction.

**Motion #1, 03-20-2001.** Pierre Boulos put forth a motion to accept the minutes of February 20th, 2001 general meeting as printed in the newsletter. Susan Sawyer-Beaulieu seconded the motion. Motion carried unanimously.

### Reports

**Secretary** - Joady Ulrich

Correspondence received in regards to a Star Cruise from the Amateur Astronomers Association of Pittsburgh June 14<sup>th</sup> to 17<sup>th</sup> information will left at the table. Also The Astronomical Society of the Pacific is holding there convention July 14<sup>th</sup> to 15<sup>th</sup> if any would wish to attend. A National Geographic issue of the "Hubble Deep Field" will be at the table for anyone to view.

**Librarian** - Tom Sharron

Nothing to report.

**Director of Education** - Randy Groundwater

A talk will be given at the Kiwanis Club Thursday evening March 22<sup>nd</sup> in Wheatley. Last Wednesday March 14<sup>th</sup> a talk was given at Roseland to the Kiwanis. Dr. Pierre I. Boulos gave a talk on Cosmology at the Unitarian Church called "Cosmological Whisperings". Susan Sawyer-Beaulieu had an observing session with some 12 scouts and parents. Frank Shepley was asked to give a talk at Bryerswood June 1<sup>st</sup> & 2<sup>nd</sup> to a group of Girl Guides. Steve Pellerin gave a talk Saturday March 17<sup>th</sup> at Market Square Science Exhibit to the public and had a series of telescopes displayed. Some of the students also had their work on display. Steve also mentioned that he is on Science Center Committee. A 10,000 sq. foot area is set aside for Astronomy and are looking for a corporate sponsor to possibly open a Planetarium. Imax has expressed interest in setting up.

**Editor** - Steve Mastellotto

Request for articles, nothing else to report.

**Phone Committee** - Steve Mastellotto

Phone committee was active and members should have received a phone call or an e-mail. The e-mail list is now up to 40 members. If anyone has not received a call or e-mail see Steve.

**National Council Rep. & Treasurer** - Frank Shepley

Nothing to report.

Tin Bennett reported on the National Council Meeting. The setting of the budget for national for next year and the 2000 budget came up with a deficit of \$8,723.00, next year their looking to show a positive level. The finance committee recommended no fee increases and council overturned that recommendation. A \$4.00 increase is being considered and will be voted on at the G. A.. The new center of Prince George was made known and is now the 26<sup>th</sup> center of the R.A.S.C.. The official Astronomy Day was set as April 28<sup>th</sup> with the theme "Bring Astronomy to the Public". A new observing certificate for beginning members is being proposed. A Messier certificate for half (50) the objects. The Messier certificate would be done in two stages but more record would be required. A new logo sticker has been introduced and a new hand out now available in French. A pamphlet on the dark sky reserve will available at the table for viewing.

**Director of Observing** - Robin Smallwood

Robin past out a hand out of a sky chart of Leo. Robin highlighted M44 Beehive Cluster, M95 & 96 Galaxies, and M105, M9 and M6.

The Messier Marathon is scheduled for this Saturday March 24<sup>th</sup> at Dan Taylor's House

### Business

**Short Talk** - Dave Panton

Dave explained the process involved in the construction of a 6" Dobsonian telescope he worked on for the Windsor Centre collection. Dave told of the different processes and unique materials used in its construction.

Thanks to Dave for all his good work.

50/50 draw was won by Vince Rawlings, \$15.00

Thanks to Tom Sharron for preparing the Coffee & Hot Chocolate for break time.

**The Guest Speaker**

Frank Shepley introduced Phil McCausland. The topic was "The Fall & Recovery of Tagish Lake Meteorite B.C." Fireball event of January 18<sup>th</sup>, 2000. Meteorite background, search and retrieval in part April & May 2000. On January 18<sup>th</sup>, 2000 many people seen, heard and felt in the Yukon, East Alaska and North Western British Columbia, the entry into the atmosphere a meteorite crash on Tagish Lake. Phil explained how the expedition and fragment retrieval was done.

Meeting was adjourned at 10:25 p.m.

Thanks go out to the volunteers for the clean up of the hall after meeting.