NOVA NOTES

BI-MONTHLY JOURNAL OF THE HALIFAX CENTRE

1975
VOL 6
NO 2
MARCH APRIL

Officers of the Halifax Centre for 1975

Pres.: Dr. Roy Bishop, Dept. of Physics, Acadia University, Wolfville, N.S.

V-Pres.: Mr. Peter Edwards, 8 Sullivan's Hill Bedford, N.S.

Sec'y.: Dr. Peter Reynolds, Dept. of Physics, Dalhousie University, Halifax

Treas.: Mr. Bill Sheppard, 1122 Tower Rd., Halifax

Editor: Mr. Randall Brooks, Dept. of Astronomy Saint Mary's University, Halifax

NOVA NOTES are printed six times yearly (Jan., March, etc.) through the courtesy of the Nova Scotia Museum. Contributions on any aspect of astronomy are welcomed from non-members and members of the Halifax Centre. Closing date for the May issue will be April 18 and articles should be prepared in the format of this issue.

CONTRIBUTORS to this issue are;

Roy Bishop, Diane Brooks, Murry Cunningham, J.E. Kennedy (Saskatoon), Peter Reynolds, Walter Zukauskas, and I, the editor, threw in a few tid-bits of useful/useless (delete one) information.

UPCOMING MEETINGS

March 21, 8:00 PM at the Nova Scotia Museum, Summer St., Halifax. This is Members Night which means you are the speakers. Have you some slides, movies, tapes etc. which you think other members would enjoy? If you intend to bring something please contact Dr. Peter Reynolds (424-2325) or Randall Brooks (422-7361 ext 255)

April 18 we hope to have a well known environmental prediction man tell you about weather patterns over the Maritimes and why you always miss those special observational opportunities by minutes because of those clouds.

RW ARIETIS

For many years RW Arietis was regarded as just another RR Lyrae type pulsating variable--RRc to be specific--of 12th magnitude and period of about 0.3543184 days. Being fainter than many similar stars, RW Ari suffered from scanty observational coverage.

All that changed when Wisniewski (1971) announced that RW Ari was one component of an eclipsing binary system having an orbital period of 3.2 d. His results are summarized in fig. 1. The top, dotted curve represents the average light curve of the RRc variable without interference of eclipses.

Observations made on Julian days 2439384, 411 and 505 show the variable fainter than usual, and the data from day 384 show a clear eclipse effect. The day 411 data were obtained during the shallow secondary eclipse minimum and those of day 505 during the deep primary eclipse.

Fig. 2 shows the eclipsing light curve partially cleared of the RRc variation. In particular, the light variation due to the pulsation (RRc) has been eliminated. However, the accompanying size changes of the RRc star have not been removed. Until this is accomplished, the similarity between this light

Magnitudes by Detre:

a = 11m.75

b = 11.77

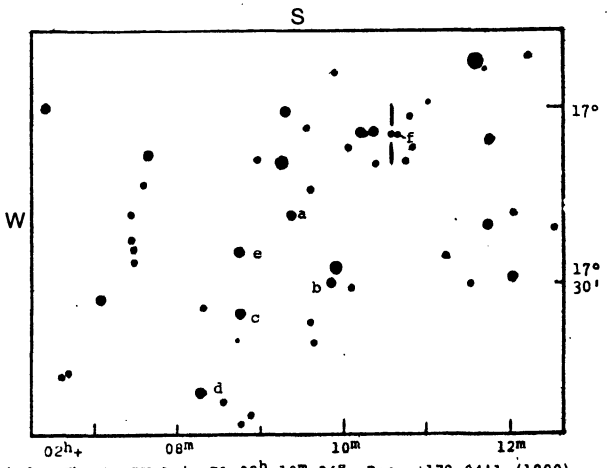
c = 11.85

d = 12.06

e = 12.39

f = 12.61

(Star a = BD +17° 328)



Finder Chart, RW Ari, RA 02h 10m 34s, Dec. +17° 04'.1 (1900)
South at top. Traced from Stamford Observatory Photograph.

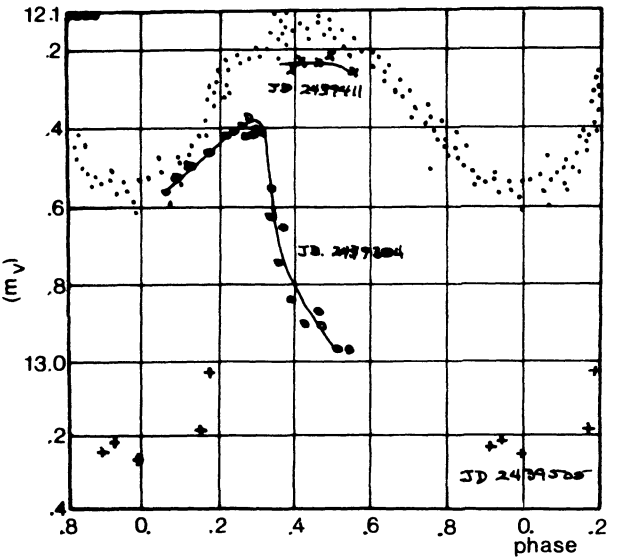


Fig 1 PHASE—RR LYRAE

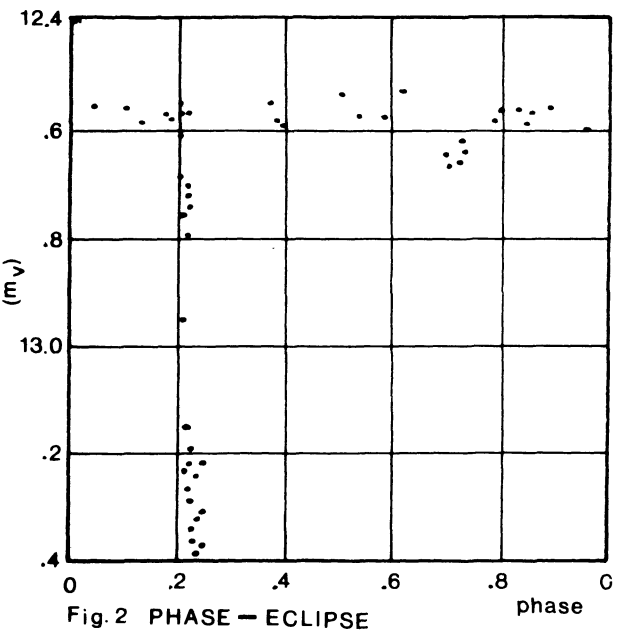


Fig. 2 PHASE — ECLIPSE

curve and those of other eclipsers will be superficial only.

Following the light variations of this complicated system should provide great variety and will prove most rewarding. The interaction of the two separate light variations will cause minima to arrive both early and late, will vary the shapes of minima from one eclipse to the next, and will produce minima of differing depths. Times of primary eclipse minima are given by the following elements:

$$T(i) = JD\ 2439384.97 + 3.1754\ n$$

The system is a faint one, probably requiring a 10" telescope or larger for its visual observation.

Bibliography:

Wisniewski (1971) Acta Astr., 21, no. 3
Woodward (1972) Journal AAVSO, 1, 68

Walter Zukauskas

JUPITER AFTER PIONEER 10

Pioneer 10 has, in its recent flypast of Jupiter, shed much new knowledge about Jupiter's moons, atmosphere and interior structure which combined gives us a more complete picture of its past. Here are some of the major findings reported from the preliminary studies.

Galilean Satellites;
The density of the four planet sized moons is directly proportional to their distance from the planet. It decreases form the density of rock for the closest moons -Io and Europa- to a density similiar to a rock and ice mixture for Ganymede and Calisto. This is probably due to the amount of heat radiated by the planet at the time of formation. Although preliminary processing only has been completed, the surface of Ganymede appears very similar to those of Mars and our Moon. Io has an H, N and Na atmosphere that is tenuous but Europa and Calisto

were not observed to have atmospheres but are thought to have some tenuous wisps anyway. Ganymede is known to possess one from previous observation.

Jupiter's Atmosphere;
Jupiter's atmosphere contains circular cyclones and anti-cyclones which extend around the planet. This is thought to be due to the effects of heat radiation from the planet's interior and its 35,200 kmh^{-1} rotational speed. This 'weather stretching' is responsible for the alternating reddish-brown and white bands. The Pioneer pictures show huge and striking cloud features which indicate strong atmospheric upwelling. Pioneer 10 has shown that the white bands are cloud ridges of rising temperature 20 km above the cloud deck. The prominent reddish-brown bands are troughs of descending atmosphere 20km deep and individual clouds seen by Pioneer show the same rising-falling scheme of circulation. The problem of the Red Spot is not solved as yet but it is now seen to be the vortex of an intense storm several hundred years old. The 25,000mi long mass of whirling clouds towers 5mi above the surrounding clouds.

Jovian Interior;
Jupiter seens to have a turbulent interior which is much hotter than previously thought and appears to have an almost entirely liquid structure without solid surface and if one exists, only a very small core of rocky material. Jupiter's magnetic field is much larger than some models predicted and its radiation belts are far more intense than expected. Jupiter is a source of high energy particles--the only one other than the sun in the solar system--and it may be possible to measure some of these at the surface of the earth. And probably the most surpising result and the most important for our understanding of the origin of the solar system and the early conditions there is the fact that Jupiter was much hotter than had been considered possible at its formation four and a half billion years ago.

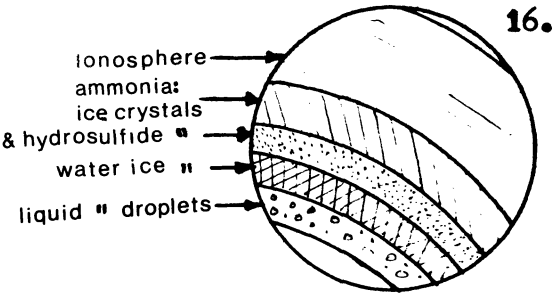
The diagrams on the following page give a visual summary as it is now envisaged.

R.C. Brooks

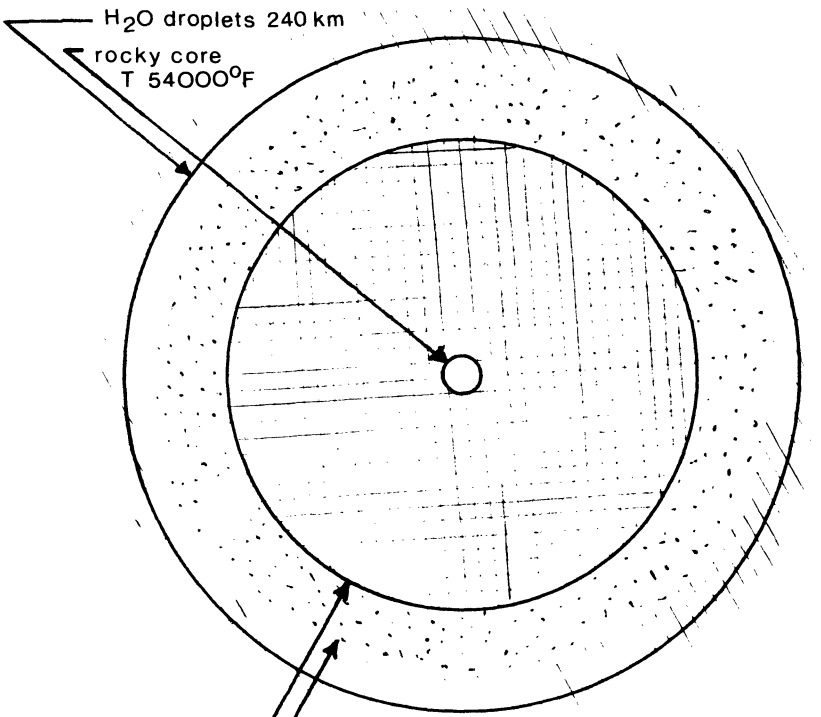
JUPITER;

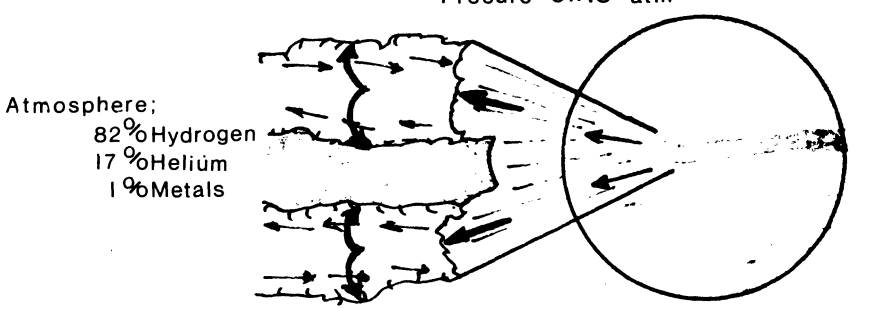
Atmospheric &

Interior Models



polar radius 41,480 mi





HAVE YOU READ ?

Scientific American Jan. 1975 p24 The nature of Asteroids- Some of us were fortunate enough to have seen Eros at the observatory after the last meeting so this topic is "hot". But what are they made of? It seems that most meteorites are fragments of asteroid collisions. These meteorites can give us a clue to the composition of the parent Asteroid. As you know the composition of meteorites varies widely. So they come from different "layers" of asteroids. And there are possibly different types of Asteroid in the different belts of asteroids. Yes there are belts of asteroids, some close to Mars and others very close to Jupiter. So go to your near est museum that has on display a meteorite and meditate on the nature of Asteroids.

Same Issue p 126- For those of you that have everything, how about an Astrolabe kit? Mind you it is bronze simulated cardboard and is very difficult to build but it works and one of our members should try.

National Geographic, Feb.75 Jupiter.

Murray Cunningham

MINUTES OF THE JANUARY MEETING

The January meeting of the Halifax Centre was held in Room 155, St. Mary's University on Friday evening, January 17, 1975.

Dr. Bishop opened the meeting with some general announcements followed by news concerning preparations which are underway for the General Assembly here next summer.

The guest speaker for the evening was Mr. Martin Zatzman, a graduate student in astronomy at St. Mary's University, who spoke on the subject Space Craft: Manned Vehicles to the Stars-Past,Present,Future.

This was one of the most interesting and certainly one of the best illustrated talks we have enjoyed in some time. Martin began by describing some of the early space efforts of the Russians (remember Yuri Gagarin?) and the subsequent American efforts to catch up (highlights of the Mercury, Gemini and Apollo programs complete with a recording of Neil Armstrong's voice from the Moon). He concluded his summary of the Past with a discussion of Skylab and the unmanned Mariner and Pioneer probes to neighbouring planets. Martin sees the Present in terms of the Viking lander, an unmanned probe to Mars planned for later this year. This complex vehicle will measure marsquakes, test for life and do all sorts of other clever little things. Also in Present Time, the Space Shuttle, a rocket-plane combination designed to ferry people back and forth to OAO's, Skylabs, etc. The Future, Martin feels, will mean nuclear powered vehicles and 11-man life support systems, all set for manned exploration of Mars in the 1980's

Following the formal talk, there was an opportunity for those present to examine the model rocket display which Mr. Zatzman had arranged at the front. Refreshments were then served and the Observatory opened for viewing.

P.H. Reynolds
Secretary

MINUTES OF THE FEBRUARY MEETING

The February meeting of the Centre was held at 8:15 p.m. on Thursday, February 13 in room 247 of the Academic Complex, St. Mary's University. This was a joint meeting with the Nova Scotia Institute of Science and a large audience was present. The guest speaker, Dr. Robert Roeder of the University of Toronto spoke on the subject Black Holes, White Holes and Worm Holes.

Dr. Roeder began his journey into these strange worlds by describing the relatively familiar black hole. After a star has exhausted all of its nucleur fuel it may undergo complete gravitational collapse and become a black hole. If we were to approach such an object, we would pass through the event horizon and from that point on would not be able to communicate with the outside world. Hence the object is invisible or black. While this situation certainly appears bleak, it may not be the end for it appears that there may be a second universe joined Siamese twin style to our own at the event horizon. The wormhole, or Einstein-Rosin bridge, connects these two flat universes. Unfortunately one cannot make the trip through the wormhole without exceeding the speed of light. If, however, the black hole is rotating it appears that there may be a bridge connecting an infinite number of separate universes. Moreover, space travel between different universes is possible! This brings us to white holes, matter and energy from other universes entering ours through rotating wormholes. Maybe this is the explaination of the enormous energy output of quasars and the peculiar exploding galaxies.

In the end, refreshments were served in our little corner of the world.

P.H. Reynolds
Secretary.

"CARRYING THE FIRE"

By: Michael Collins
Published by: Farrar,Strane & Giroux, 1974

The Apollo 11 astronauts approach the moon--day 4;
"Our first shock comes as we stop our spinning motion and swing ourselves around so as to bring the moon into view. We have not been able to see the moon for nearly a day now, and the change in it's appearance is dramatic spectacular, and electrifying. The moon I have known all my life, that two-dimensional, small yellow disc in the sky, has gone away somewhere, to be replaced by the most awesome sphere I have ever seen. To begin with, it is huge, completely filling our window. Second it is three-dimensional. The belly of it bulges out toward us in such a pronounced fashion that I almost feel I can reach out and touch it, while its surface obviously recedes toward the edges. It is between us and the sun, creating the most splendid lighting conditions imaginable. The sun casts a halo around it, shining on its rear surface, and the sunlight which comes cascading around its rim serves mainly to make the moon itself seem mysterious and subtle by comparison, emphasizing the size and texture of its dimly lit and pockmarked surface."

"To add to the dramatic effect, we find we can see the stars again. We are in the shadow of the moon now, in darkness for the first time in three days, and the elusive stars have reappeared as if called especially for this occasion. The 360-degree disc of the moon, brilliantly illuminated around its rim by the hidden rays of the sun, divides itself into 2 distinct central regions. One is nearly black, while the other basks in a whitish light reflected from the surface of the earth. Earthshine...is considerably brighter than moonshine on the earth. The vague reddish-yellow of the sun's corona the blanched white of earthshine, and the pure black of the star-studded surrounding sky all combine to cast a bluish glow overthe moon. This cool, magnificent sphere hangs ominously, a formidable presence without sound or motion, issuing us no invitation to invade its domain. Neil sums it up: 'It's a view worth the price of the trip.' And somewhat scary too, although no one says that."

FROM THE CENTRES

In 1971, the Hamilton Centre received a 30" reflecting telescope-the fifth largest in Canada-donated anonymously by an optical company. However, to keep the $150,000 gift the centre must provide an observatory.

Hopes are high that the history of a similar project will not repeat itself. In 1965 the centre was offered $1,000,000 by Salada Foods for the construction of a 155 seat planetarium. However, the only catch was that the planetarium should be ready for Centennial year. So much time was lost in obtaining approval for a proprosed site from the Ontario Municipal Board, that the land was not granted in time and Salada withdrew their offer.

This year a 5.8 acre site for the proposed observatory has been granted by the township of East Flamborough, and a 99-year lease has been signed. The area is bushland, therefore, the members of the centre have been infused with the pioneer spirit and have taken to clearing the land on weekends. A road has already been cleared and a parking area is almost complete.

Donations are hard to come by and to date they have secured $2,500 from Molson's Breweries, the municipalities of Waterdown and East Flamborough and the centre's 70 members. The Federal Government's Local Initiatives Program turned down the centre's requested grant because it was larger than the accustomed allotments for much of the Hamilton area. The estimated amount required is $110,000.

The completed complex will include the 30" telescope, two 12" telescopes, laboratory facilities for astral photography and radio

astonomy equipment, as well as an 88-seat auditorium-theatre. This building will be surrounded by four two-story domes which will be constructed in stages. In addition a concrete storage unit for equipment will be built later.

The Hamilton Centre hopes to include the observatory and auditorium in educational programs, and, thus carry on their tradition of offering lectures, programs and telescope making demonstrations to schools and the public. In addition, extensive research will be possible with the equipment and a hoped-for astronomical library.

At this time the centre desires to complete the first dome in time for the world convention of the International Union of Amateur Astronomers. Hamilton will host 150 delegates from around the world between July 27 and August 2.

Diane Brooks

Note: The Editor has a number of newsletters from other centres across the country. These include; Orbit (Hamilton), Stardust (Edmonton) AstroNotes (Ottawa), 'Scope (Toronto), Winnicentrics (Winnipeg), and Astronomy London. Anyone who is interested may borrow any of these just by asking. The Hamilton Centre has compiled a 13 page article on the Pioneer 10 findings about the structure of Jupiter's atmosphere and interior, which you will find most informative. Edmonton should be congratulated on their consistantly fine publication. Their success results from the large number of contributors and wide variety of subject content (hint,hint). Ottawa wins the observing prize--they have a separate monthly meeting for their observers with 50 showing up at each gathering.

MEMBERS OF HALIFAX CENTRE--1975

1: Bashow, Gary
1840 Robie St
B3H 3C3

2: Beveridge, Foster
RR 1 Mahone Bay

3: Bishop, Roy
Dept of Physics
Acadia Univ,
Wolfville

4: Brooks, Randall
Dept of Astronomy
Saint Mary's Univ

5: Burleson, Debbie
Sherrif Hall
Dalhousie Univ

6: Burton, Richard
12 Patterson Ave
Dartmouth

7:* Burke-Gaffney, Rev.M.W.
Dept of Astronomy
Saint Mary's Univ

8: Cunningham, R.M.
6299 Payzant St

9: Diamond, Gerald
Dept of Astronomy
Univ of Toronto
Toronto

10: Dupuy, David L.
Dept of Astronomy
Saint Mary's Univ

11: Edwards, John
2240 Armcresent West
B3L 3E3

12: Edwards, Michael
8 Sullivan's Hill
Bedford

13: Edwards, Peter
8 Sullivan's Hill
Bedford

14: Edwards, Tony
8 Sullivan's Hill
Bedford

15: Grant, W.G.
5489 Spring Garden

16: Hall, James S.
Apt.8
6269 Cork St

17: Hankinson, Douglas
RH II, Rm 8-1-3
Saint Mary's Univ

18: Hibbitts, Barnard
1625 Preston St
B3H 3V2

19: Holmes, James K.
Dept of Astronomy
Saint Mary's Univ

20: Johnson, Glen
Box 27, Armdale RR 1

21:* King, Mary
Ferguson's Cove
Halifax Co.

* Life Members

22: LaRade, Roger
HR II, Rm 4-3-4
Saint Mary's Univ

23: McClaymont, Hamilton
Apt 400
2001 Brunswick St

24: McKinnon, P.
2731 Geo. Dauphinee Ave

25: Mitchell, George
Dept of Astronomy
Saint Mary's Univ

26:*Maunsell, C.D.
23 Esson Rd
Dartmouth

27: Melanson, Kim
1855 Vernon St

28: Proctor, Peter
6463 Coburg Rd

29: Purcell, Chris
Dept of Physics
* Dalhousie Univ

30: Reynolds, Peter
Dept of Physics
* Dalhousie Univ

31: Sheppard, Bill
1122 Tower Rd

32: Silvert, W.L.
Dept of Physics
Dalhousie Univ

33: Stokoe, Peter
* 6189 Regina Terr

34: Tindall, David
PO Box 240, StFXU
Antigonish.

35: Weingartschofer, A.
Dept of Physics, StFXU
Antigonish

36: Williams, Sherman
Bluff Rd
Avonport RR 1

37: Williamson, Robert
7155 Morningside Dr.

38: Welch, Gary
Dept of Astronomy
Saint Mary's Univ

39: Zukauskas, Walter
Dept of Astronomy
* Saint Mary's Univ

This list has been included only with Nova Notes sent to members and is for members use only. If you note any errors, someones name missing, or if we don't have your postal code please send the Editor the appropriate correction or addition.

STEADY STATE ASTRONOMY

Astronomical theories are anything but in a steady state and the condensed concepts presented here demonstrate the evolving nature of scientific thought. Contributions are always welcome.

FROM: Journal of the Interplanetary Society, March '54
"What parts of the lunar surface will be most suitable for landing sites when travel to our satellite becomes a reality?" Selenography, the visual study of the lunar surface, has been applied to this practical problem. From his experience, Dr. Percy Watkins concluded that dark regions are apt to be smoother than bright regions. Magnification by successively larger telescopes indicated to him the small scale roughness of the surface in general but he decided that the interiors of craters like Archimedes and Plato would be the most suitable for landing spacecraft. He insisted that detailed reconnaissance from a few miles would be required because even large telescopes show the areas under consideration as small dots. He also predicted that the spacecraft would need some degree of manoeuvrability.

FROM: Icarus, February 1965
Studies by several astronomers has resulted in a consensus that the outer layer of the moon has a porous microstructure. However the form of the micron or millimeter sized particles is still very much in dispute. Some of the theories have likened the surface fairy castles, reindeer moss, skeletal fuzz and cotton candy with the latest addition being the 'ping-pong' model of T. Gehrels.
The lunar surface as he sees it, is covered with an overlying layer of dust particles held in suspension above the dust free surface by electrostatic forces. To correctly predict the photometric and polarimetric observations--for example the fact that the brightness increases when features are illuminated by a nearly full moon--Dr. Gehrels finds the cloud would have to be only 0.06mm thick with a particle spacing of only 8 microns which would also be the particle size.

TELESCOPE RAMBLINGS

Like a chain, a telescope is only as good as its weakest link. The component of a telescope which probably receives the least consideration by amateur astronomers (and telescope manufacturers too!) is the eyepiece. Although most eyepieces on the market today are fairly good, some are distinctly superior to others. When one considers the cost in dollars and/or time of the rest of a good telescope, it is false economy indeed to make do with a second-rate eyepiece.

After a few years of observing, many amateur astronomers often find one eyepiece which they use more than any of the others they may own. The best eyepiece I have discovered after several years of observing with several telescopes is the "Galoc EL-16". It has the following merits:

1. It has an extra wide apparent angular field of about 70°. Compared to most other eyepieces, it is like looking at the universe through a hole in a fence rather than through a pipe. Such a wide field is esthetically nice and is a great convenience both for finding objects and for viewing moderately broad objects.

2. It has an intermediate focal length of 16.3 mm. This provides a very useful, low to intermediate magnification (12x per inch on an f/8 system), together with a comfortable eye relief.

3. It is free of ghost-images. Many modern eyepieces fail this test and display annoying reflections when one is looking at a fairly bright object such as Jupiter.

4. It is a 4-element design with all surfaces properly coated. According to advertisements, one or more of the surfaces is aspheric. Star images in the central part of the field are very sharp. The lenses are mounted in a substantial, well-machined, single-piece, brass cylinder.

It is sold by:

Star Flite Instrument Co.
P. O. Box 118
Bath Beach Station
Brooklyn, N.Y. 11214

Order: EL-16 Galoc ocular, 1¼" O.D.

At $23.50 US it is very reasonable.

Roy L. Bishop

ASTRONOMY IN CANADA

J.E. Kennedy

In the winter solstice 1974 issue of Cassiopeia, the newsletter of the Canadian Astronomical Society, there appeared a list of books compiled by J.E. Kennedy of the Univ of Saskatchewan, Dept of Physics. These books have been collected by him over the years and during a sabbatical leave spent in London. He was researching the early history of Canadian astronomy and was supported by a Canada Council Fellowship. The following list contains many of the nineteenth century books which he found relevant in his studies of the development of astronomy in Canada which incidently had its first professional roots at the Univ of New Brunswick where William Jack established the transit instrument which is still extant. The Irving Library of the Univ of New Brunswick still contains the books of William Jack and it is hoped that Prof. Kennedy will make available a listing of these in the future.

Airy, George Biddell. Popular Astronomy: A Series of Lectures delivered at Ipswich. Sixth edition revised. London: Macmillan and Co., 1868.

Airy, Sir George Biddell. Numerical Lunar Theory. London: Eyre and Spottiswoode, 1886.

Aldis, Mrs. William Steadman. Consider the Heavens: A Popular Introduction to Astronomy. Oxford: The Religious Tract Society, 1895.

Arago, François. Astronomie Populaire. 4 vols. Deuxième Edition. Paris: Librarie des Sciences Naturelles, 1865.

Arrhenius, Svante. The Life of the Universe. 2 vols. Translated by Dr. H. Borns. Reprint edition. London: Harper & Brothers, 1914.

Ball, Sir Robert Stawell. An Atlas of Astronomy. London: George Philip & Son, 1892.

_____ The Earth's Beginnings. New York: Cassell and Company, Limited, 1901.

_____ Great Astronomers. New and revised edition. London: Sir Isaac Pitman and Sons Limited, 1906.

_____ A Primer of Astronomy. Reprinted edition. Cambridge: The University Press, 1912.

_____ Star-Land: Being Talks with Young People about the Wonders of the Heavens. London: Cassell and Company, Limited, 1894.

_____ In Starry Realms. London: Isbister and Company Limited, 1892.

_____ The Story of the Heavens. New and revised edition. London: Cassell and Company, Limited, 1905.

_____ The Story of the Sun. London: Cassell and Company, Limited, 1901.

_____ Time and Tide, Romance of the Moon. London: Society for Promoting Christian Knowledge, 1889.

Barlow, C. W. C., and Bryan, G. H. Elementary Mathematical Astronomy, with Examples and Examination Papers. University Correspondence College Press. London: Clive & Co., 1893.

Blunt, Charles F. Beauties of the Heavens. 1849.

Brewster, Sir D. Martyrs of Science. 1861.

Brewster, David. The Life of Sir Isaac Newton. London: John Murray, 1831.

Buckley, Arabella B. A Short History of Natural Science, and of the Progress of Discovery from the Time of the Greeks to the Present Day. Fifth edition. London: Edward Stanford, 1894.

Bürgel, Bruno H. Astronomy for All. Translated from the German by Stella Bloch. London: Cassell and Company, Ltd., 1911.

Burnham, Sherburne Wesley. Double Star Observations 1877-78. Reprint from "Memoirs of the Royal Astronomical Society", vol. XLIV.

Chambers, George F. Descriptive Astronomy. Oxford: The Clarendon Press, 1867.

_____ A Handbook of Descriptive and Practical Astronomy. Fourth edition. Vol. I: The Sun, Planets, and Comets. Vol. II: Instruments and Practical Astronomy. Vol. III: The Starry Heavens. Oxford: The Clarendon Press, 1890.

_____ The Story of the Solar System. London: George Newnes, Ltd., 1902.

Chauvenet, William. A Manual of Spherical and Practical Astronomy. Vol. I: Spherical Astronomy. Fourth edition, revised and corrected, 1871. Vol. II: Theory and Use of Astronomical Instruments. Fifth edition, revised and corrected, 1874. Philadelphia: J. B. Lippincott & Co.

Christie, W. H. M. Astronomy. London: Society for Promoting Christian Knowledge, 1875.

Clerke, Agnes M. Problems in Astrophysics. London: Adam & Charles Black, 1903.

_____ The System of The Stars. Second edition. London: Adam & Charles Black, 1905.

_____ A Popular History of Astronomy during the Nineteenth Century. Fourth edition. London: Adam and Charles Black, 1903.

Dick, Thomas. The Sidereal Heavens, and Other Subjects Connected with Astronomy. London: Charles Griffin and Company, 1859.

_____ Celestial Scenery: or, The Wonders of the Planetary System Displayed. New edition. London: Charles Griffin and Company.

Flammarion, Camille. Astronomy for Amateurs. Translated by Frances A. Welby. London: Thomas Nelson and Sons, Ltd., 1903.

_____ Popular Astronomy: A General Description of the Heavens. Translated by J. Ellard Gore. New and revised edition. London: Chatto & Windus, 1907.

Giberne, Agnes. Radiant Suns. London: Seeley and Co. Limited, 1895.

_____ Sun, Moon, and Stars. New and revised edition. London: Seeley and Co. Limited, 1897.

_____ This Wonderful Universe: A Little Book about Suns and Worlds, Moons and Meteors, Comets and Nebulae. New edition, rewritten. London: Society for Promoting Christian Knowledge, 1920.

Gore, J. Ellard. Astronomical Curiosities: Facts and Fallacies. London: Chatto & Windus, 1909.

_____ Astronomical Essays: Historical and Descriptive. London: Chatto & Windus, 1907.

_____ Geodesy. Heinemann's Scientific Handbooks. London: William Heinemann, 1891.

Grant, Robert. History of Physical Astronomy, from the Earliest Ages to the Middle of the Nineteenth Century. London: Robert Baldwin, 1852.

Guillemin, Amédée. The World of Comets. Translated and edited by James Glaisher. London: Sampson Low, Marston, Searle, & Rivington, 1877.

Hammond, John. The Practical Surveyor. Second edition. Carefully revised, corrected and enlarged by Samuel Warner. London: printed for T. Heath, 1731.

Harkness, Wm. The Solar Parallax and Its Related Constants, Including the Figure and Density of the Earth. Washington: Government Printing Office, 1891.

Herschel, Sir John F. W. Familiar Lectures on Scientific Subjects. London: Alexander Strahan, 1867.

_____ A Treatise on Astronomy. (The Cabinet Cyclopaedia conducted by the Rev. Dionysius Lardner). London: Longman, Rees, Orme, Brown, Green, and Longman, and John Taylor, 1833.

_____ Outlines of Astronomy. Eleventh edition. London: Longmans, Green, and Co., 1871.

Hiley, Rev. Alfred. Explanatory Mensuration for the Use of Schools. Sixth edition. With a new chapter on Land-Surveying by Rev. John Hunter. London: Longmans, Green, and Co., 1879.

Holder, William. A Discourse Concerning Time. Second edition. London: J. Heptinstall, 1701.

Huggins, Sir William, and Huggins, Lady. An Atlas of Representative Stellar Spectra from λ4870 to λ3300. London: William Wesley and Son, and Hazell, Watson, & Viney, Ltd., 1899.

von Humboldt, Alexander. Cosmos: Sketch of a Physical Description of the Universe. Translated under superintendence of Major-General Edward Sabine. Vol. IV, Part 1. London: Longman, Brown, Green, Longmans, & Roberts, and John Murray, 1858.

Lardner, Dionysius, editor. The Museum of Science & Art. Vol. I. London: Walton and Maberly, 1854.

Libby, Walter. An Introduction to the History of Science. London: George G. Harrap & Co. Ltd., 1918.

Lockyer, J. Norman. Astronomy. Science Primers, edited by Huxley, Roscoe, and Balfour Stewart. Fifth edition. London: Macmillan and Co., 1877.

Lodge, Oliver. Pioneers of Science. London: Macmillan and Co., 1893.

Lowell, Percival. Mars and Its Canals. New York: The Macmillan Company, 1906.

Macpherson, Hector, Jun. Through the Depths of Space: A Primer of Astronomy. Edinburgh: William Blackwood and Sons, 1908.

Marcet, Mrs. Conversations on Natural Philosophy. Thirteenth edition. London: Longman, Brown, Green, Longmans, & Roberts, 1858.

Maunder, E. Walter. Astronomy Without a Telescope. London: W. Thacker & Co., 1904.

_____ The Science of the Stars. The People's Books. London: T. C. & E.C. Jack, 1912.

Mitchell, O. M. The Orbs of Heaven: or, The Planetary and Stellar Worlds. London: Routledge, Warne, and Routledge, 1865.

Newcomb, Simon. Astronomy for Everybody. Introduction by Sir Robert S. Ball. London: Sir Isaac Pitman & Sons, Ltd., 1907.

_____ Catalogue of 1098 Standard Clock and Zodiacal Stars. 1882.

_____ Popular Astronomy. Second edition, revised. London: Macmillan & Co., Limited, 1898.

_____ The Stars: A Study of The Universe. London: John Murray, 1904.

Proctor, Richard A. A New Star Atlas for the Library, The School and the Observatory. Revised and corrected by T. E. Espin (1895). London: Longmans, Green, and Co., 1901.

_____ The Expanse of Heaven: A Series of Essays on the Wonders of the Firmament. Second edition. London: Henry S. King & Co., 1874.

Proctor, Richard A. Flowers of the Sky. A new edition. London: Chatto & Windus, 1905.

_____ Mysteries of Time and Space. A new edition. London: Chatto & Windus, 1905.

_____ The Orbs Around Us: A Series of Familiar Essays. London: Longmans, Green and Co., 1912.

_____ Pleasant Ways in Science. London: Chatto and Windus, 1879.

_____ The Sun: Ruler, Fire, Light, and Life of the Planetary System. Third edition. London: Longmans, Green, and Co., 1876.

_____ The Universe of Suns and Other Science Gleanings. A new edition. London: Chatto & Windus, 1905.

Raeder, Hans, Strömgren, Elis, and Strömgren, Bengt, translators and editors. Tycho Brahe's Description of his Instruments and Scientific Work as given in Astronomiæ Instauratæ Mechanica (Wandesburgi 1598). Kobenhavn: I Kommission Hos Ejnar Munksgaard, 1946.

Rudaux, Lucien, and de Vaucouleurs, G. Larousse Encyclopedia of Astronomy. Introduction by F. L. Whipple. Translated by Michael Guest and John B. Sidgwick and revised by Z. Kopal. London: Paul Hamlyn Limited, 1959.

Smyth, William Henry, and Chambers, George F. A Cycle of Celestial Objects. Revised, condensed and greatly enlarged. Second edition. Oxford: The Clarendon Press, 1881.

Somerville, Mrs. Mary. Mechanism of the Heavens. London: John Murray, 1831.

Tancock, E. C. The Elements of Descriptive Astronomy. Second edition. Oxford: The Clarendon Press.

Taylor, Lucy. Astronomers and Their Observations. London: S. W. Partridge & Co.

Thé, Jay H. The Sun and His Satellites. London: Simpkin, Marshall, Hamilton, Kent & Co., Ltd., 1909.

Todd, David P. Stars and Telescopes, A Hand-Book of Popular Astronomy. Boston: Little, Brown, and Company, 1899.

Turner, H. H. A Voyage in Space: A Course of Six Lectures. London: Society for Promoting Christian Knowledge, 1915.

Wallace, Alfred R. Man's Place in the Universe. New edition. London: Chapman and Hall Limited, 1912.

Ward, The Hon. Mrs. Telescope Teachings. London: Groombridge and Son, 1859.

Whewell, William. Astronomy and General Physics Considered with Reference to Natural Theology. (Bridgewater Treatise). London: William Pickering, 1847.

Young, C. A. The Sun. The International Scientific Series. New York: D. Appleton and Company, 1881.

_____ The Sun. New and revised edition. New York: D. Appleton and Company, 1897.

Science Lectures For The People, First Series, 1866-67, and Second Series, 1970-71. First series by Roscoe, Alcock, James and Morgan. Second Series by Huxley, Roscoe, Huggins, Dawkins and Ward. Manchester: John Heywood, 1871.

A Catalogue of 7385 Stars, chiefly in the Southern Hemisphere, prepared from observations made in the years 1822, 1823, 1824, 1825, and 1826, at the Observatory at Paramatta, New South Wales. Computations made and catalogue constructed by William Richardson of The Royal Observatory at Greenwich. London: William Clowes and Sons, for The Lords Commissioners of the Admiralty, 1835.

The Wonders of the Telescope; or A Display of the Wonders of the Heavens and of the System of the Universe. London: printed for Richard Phillips, 1805.

Observing Reminders

Fri. 21 March-- 1:57 AST, equinox, the beginning of spring

Tues. 22 April--Lyrid meteor shower, unfortunately under full moon. Hourly rate--15 and with velocity of 48km/sec. Shower maximum at 5:00 PM AST

Thur. 24 April--3:37 AST, appulse of Venus and 95 Tau. No occultation of the $6^{m}.2$ star is expected and therefore the event is of little scientific value. A similar event occurs between Mars and an $8^{m}.7$ star on April 20th.

Mon. 5 May-- eta Aquarid meteor shower will prove more rewarding than Lyrids. Moon is in last quarter, hourly rate is 20 and the velocity very fast at 64km/sec Peak rate is reached at 7PM AST.

Fri. 16 May-- Most favorable elongation of Mercury for the year. 22° east ie. it appears in west at sunset. It's magnitude will be 0.6.

Between March 17 and 16 May there will be 16 lunar occultations observable (theoretically) from Halifax and the greater portion will have the star disappearing behind the dark portion of the moon and therefore advantageous for photography. The brightest star to be occulted will be 54 Ori on April 16th. See p. 60 of the Observer's Handbook 1975 for the complete listing of times and circumstances.

As was brought to the attention of those attending the January meeting, the maps accompanying the grazing occultation predictions for 1975 in the Observers Handbooks were incorrectly printed. The correct maps are to appear in the February issue of the Journal which you should have received by the time you read this. If you are interested in making timings of GO's but do not know what is required contact the editor and borrow the file on them. Positions must be known to better than 100 ft. in latitude and longitude and 10 ft. for altitude. Timings are required to have an accuracy of $0^{s}.1$. 3 Halifax members are on the 1974 Roster of Observers of the Univ. of Texas!

FROM:
RASC
1747 SUMMER ST
HALIFAX NS

N.S. HALIFAX, N.S. HALIFAX, N.S.

Feb 75

TO: Royal Astronomical Society Of Canada

252 College St

Toronto Ont

M5T 1R7