NATIONAL NEWSLETTER

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Deadline is two months prior to the month of issue.

The Star of Bethlehem

The following request article is from the pen of Dr. Henry C. King, Curator of the McLaughlin Planetarium in Toronto. Dr. King came to Toronto in September, 1966, from a position as Scientific Director of the London Planetarium, England. He has a wide reputation as lecturer, author, historian, and astronomer.

Scarcely a Christmas passes without someone asking: "What was the Star of Bethlehem?" The question expresses the hope that the modern astronomer or theologian will be able to produce fresh evidence or new insight regarding the mysterious star mentioned in the second chapter of St. Matthew's gospel. The question is almost as old as the story itself. All manner of natural events have been suggested. Some people believe that the star was perceived by the Wise Men but by no-one else. Others suggest that it could have been the planet Venus, or a nova, supernova, bright comet, shower of meteorites, bolide, close grouping of two or more planets, or even a UFO. Skeptics regard it as a myth. Believers prefer to think that it was willed by God as part of the miracle of the Divine Birth. Origen ca. 200 thought it was a comet, fiery beam or starry tail; Cecco d'Ascoli of Bologna tried to track it down by drawing up a horoscope of Christ, and Bertrand Russell remarked that the depths of human credulity are almost infinite.

The bases for a natural interpretation are certainly meagre. Had a supernova comparable to that of 1572 appeared, the story might have some credence, but the best that the Chinese chronicles can provide is the nova of 5 B.C. This appeared near Altair and remained visible to the unaided eye for about 70 days, but its nature and modest magnitude would scarcely have engendered such high convictions on the part of the Wise Men. Comet Halley during its appartition of 11 B.C. passed over Jerusalem, but the year is too early and comets were invariably interpreted as omens of disaster.

Of course, once we give the term "star" a wide connotation and regard the Wise Men as astrologers, a multiple planetary conjunction offers interesting possibilities. The Rabbinic writer Isaac Abarbanel in the fifteenth century directed attention to the apparent Messianic significance of a conjunction of Jupiter and Saturn in Pisces. Kepler, intrigued by the arresting brilliance of supernova 1604 and its proximity in mid-October to a Mars–Jupiter–Saturn triangle entertained similar ideas. His calculations indicated that a fairly close grouping of Mars, Jupiter and Saturn occurred early in February, 6 B.C., and a triple conjunction of Jupiter and Saturn took place in Pisces during 7 B.C. The timings seem reasonable, for he had read Suslyga's tract in which the error in the initial epoch of the Christian era was put at –4 years. He had to admit, however, that the close grouping would not have been seen owing to its relatively small elongation

from the sun. Also, that there was no way of knowing whether a supernova had appeared about that time in history. But the more he thought about the subject the more the conviction grew that an event of this kind had heralded the birth of Christ. In his opinion the planetary configuration served as a forerunner of a bright star which, as he explained in 1614, "was not of the ordinary run of comets or new stars, but by a special miracle moved in the lower layer of the atmosphere."

The triple conjunction of Jupiter and Saturn in 7 B.C. received attention from the German chronologist C. L. Ideler. He realised that such events are relatively frequent, astronomically speaking, but thought that the one in Pisces was the sign for which the Wise Men had been waiting and which had started them on their long journey to Jerusalem. In 1856 Charles Pritchard checked Ideler's calculations and found that the two planets were never closer to each other than about one degree. Since then various writers have elaborated Ideler's theory, in particular Werner Keller in his book *The Bible as History* (1956). Keller even established a schedule for the Wise Men based on the estimated times of each of the three conjunctions. But in common with other theories that evoke an astronomical object or objects, the event fails to account for St. Matthew's description of a star moving ahead and then standing still over a specific place.

Few writers have seen the Messianic star as an illustration of the old belief in the active dualism between light and darkness. Light, intangible and mysterious, was regarded as a creative and beneficient agent, a proper attribute of Deity. Darkness was associated with evil, destruction, and at best, passivity. Consequently, the narrative of Christ's birth could have no finer embellishment than that of a light and sign in the highest heaven. By the same token, the darkness that fell during the Crucifixion symbolized the temporary withdrawal of the Divine Light. As James Ferguson showed over two centuries ago by calculation and clever use of his orrery, this particular phenomenon was certainly not produced by a solar eclipse. Yet eclipses of the sun undoubtedly gave rise to the Greek belief that darkness blanketted the earth at the deaths of Prometheus, Atreus, Hercules, Aesculapius and Alexander the Great. Similarly, cometary apparitions, novae and supernovae probably led to the notion that unusual lights in the heavens were necessarily heralds of the births of the great.

H. C. KING

The Carpenter's Chronometers I

Celestial navigation hardly rates very high on today's list of pressing astronomical problems; but once it did. Once, a couple of centuries ago, it was in fact the mainspring for much of astronomical research. The first great modern observatories were founded specifically for the study of navigation, and although in the end the main difficulty found a non-astronomical solution, the creation of those observatories and the work done in them had an immense impact on the history of astronomy proper.

The main difficulty was the problem of determining longitude at sea. Latitude is a fairly easy matter, since it can be found by measuring angles only, but longitude involves a knowledge of time. One must have a means of knowing at any given moment what the Greenwich Mean Time is, even though one's ship be in the middle of the Pacific and months out from port. (Very modern methods do away with this necessity, but historically it was so.) Clearly, an accurate clock was the answer, but in the early days none was available. By the early 1700's good pendulum clocks were available; but of course, they were no good at sea, while existing watches were so hopeless that many dispensed with a minute hand altogether. This was how the astronomers got into the picture. It was hoped that celestial phenomena could provide the necessary clock. For example, the moon moves so rapidly among the stars that even a mariner's sextant can give a good enough measure of its relative position to determine what the time must be. The only difficulty is that the mariner must have tables which relate the

moon's position to the time, and the preparation of those tables caused a fearful number of astronomical headaches. Thus, despite great effort, the astronomical attack on the problem was a slow one.

Meanwhile, more and more ships ploughed the seas in dismal ignorance of their positions. Not only were valuable cargoes forever being lost in shipwrecks, but the toll in lives was appalling. There was Sir Cloudsley Shovel, for instance, returning to England from Gibraltar in 1707 and running into heavy weather. His navigators all agreed the fleet was off Ushant, although an ordinary seaman had the temerity to advise his superiors that he reckoned otherwise. While he was being sentenced to swing from the yardarm for his mutinous attitude, the fleet sailed in accordance with the navigator's decree, ran head-on into the Scilly Isles and lost four ships and two thousand lives, Sir Cloudsley's among them. Some solution had to be found.

How urgent the problem had become can be judged from the changed attitude of the British Admiralty. When the Royal Observatory at Greenwich had been founded in 1676 for just this reason, it had been specified that it was not to cost more than £500. Even this sum had to be raised by the sale of old and decayed gunpowder to merchants, who did God knows what with it, the wood for the building had to come from an old demolished gatehouse, bricks from a demolished fort, and the incumbent astronomer was paid £100 a year (£10 withheld for taxes) and had to provide his own instruments. But now in 1714, Parliament on behalf of the Admiralty was offering a price of £20,000 for anyone who could come up with a method for determining longitude to within half a degree. That's a lot from an outfit which even in the mid-twentieth century (I speak from experience) stamped the head of every thumb-tack with the warning 'Property of the Admiralty'. (Yes, they had unusually large heads.)

A twenty thousand pound prize was the clarion call for every crank in the kingdom to set to work. There had already been a good many. Back in 1687 someone had discovered that a full glass of water overflowed at exactly full moon and new moon, so that if the times of these phases were predictable longitude could be found twice a month. A much superior method, however, involved a nostrum called "the powder of sympathy". This healed wounds of every kind, but unlike most such anodynes, had to be applied not to the wound but to the weapon that had inflicted it. Thus every ship was to be equipped with a wounded dog, and the wounding weapon (a bandage from the wound would do) was to be left on shore where every hour on the dot someone would dip it in the powder of sympathy, at which moment the dog at sea would feel a surge of healing and obligingly yelp an announcement. Then there was the idea of anchoring rocket-firing lightships every few miles across the Atlantic, it being known that that ocean is "nowhere more than 300 fathoms deep".

The Board of Longitude, which was the committee set up to administer the prize, and so had to pass judgement on all these schemes, found it necessary to have a secretary to send out their regrets to most applicants. Thus when a Dr. Woeman wrote "acquainting the Board that he can express π and the ratio of 1 to $\sqrt{2}$ in integrals, and that this comprehends the discovery of the Longitude, he was informed that the Board do not receive proposals of this kind." Mr. Owen Straton had to be told that a sundial would not win the prize, and "M. Metiriet was informed that the Board declined any interference with the quadrature of the circle". John Baptist made such a nuisance of himself over some incomprehensible scheme that he had to be rather forcefully "desired to withdraw".

The astronomers, of course, were as eager as anyone to get their hands on that £20,000. Edmond Halley had already been out bobbing around the Atlantic in the hope of calibrating longitude in terms of the variation of the magnetic compass; Nevil Maskelyne was determined to make the lunar method practicable; while others were working at making accurate predictions of the times of eclipse and occultation of Jupiter's satellites, so that these would also be a kind of celestial clock. Isaac Newton had little faith in such ideas, considering them to be "true in the Theory, but difficult to execute". He preferred a straightforward "Watch to keep time exactly: But, by reason

of the Motion of a Ship, the Variation of Heat and Cold, Wet and Dry ... such a Watch hath not yet been made".

And indeed, the conditions of the prize made very stringent demands on any such timekeeper. If a navigator were to be able to find his longitude to within half a degree at the end of a typical six-weeks voyage, it meant that the clock must have a rate constant to within three seconds a day. So impossible did this seem, and so wild were the alternative schemes presented, that the Board of Longitude became the butt of every cartoonist and satirist in London. The Board failed to see the joke, and suffered on.

But there was a man who believed he could build such a clock, an unlikely country carpenter of twenty-one named John Harrison. It would take him the rest of his life to achieve his ambition, and even that effort was minor compared to what it took to get the prize money out of the Board. Fortunately he was a Yorkshireman. Next time we'll look at how John Harrison came to invent the marine chronometer and his endless battles with the Board of Longitude.

J. D. FERNIE

—Reprinted from the *David Dunlap Doings*, with kind permission of the Editor and the author.

David Dunlap Observatory Faces Problems of Light Pollution

The proposed construction of a 60,000-seat domed football stadium as part of a housing and recreation development scheme is worrying astronomers at the University of Toronto's David Dunlap Observatory. If approved, the stadium would have a 100-acre parking lot which, along with other developments that would be attracted to the area, would flood the suburban sky with light.

Dr. Tom Bolton of the Department of Astronomy says building the stadium on a hill three miles south of the observatory would reduce the scientific potential of the Dunlap's 74-inch reflecting telescope, largest in Canada.

The Richmond Hill town council has given the developers approval in principle to approach the City of Toronto, owner of the 640-acre site, to negotiate its purchase. But City Hall has final say on the release of the land, and since it is planning to revamp the CNE stadium and expand its seating capacity, another major stadium would be in competition with these plans.

Dr. Bolton acknowledges that the area is ideal for a housing development and says that while designating it as parkland would be best from the astronomers' point of view, a well-planned housing project might not hurt the observatory's capabilities that much. "But that would depend on what type of housing is to be built," explains Dr. Bolton. "Apartment developments are the worst for giving off light, while single family homes surrounded by trees produce the least sky illumination."

During the last several years, U of T astronomers have faced problems from various types of outdoor lights, street lighting in particular. A world-famous program being carried on by Dr. Helen Hogg had to be shifted, in 1970, to the observatory's other telescope on a mountain top in Chile.

Dr. Bolton is encouraged by the good response from politicians, civil servants, developers and residents in Richmond Hill. Many of the street lights in the observatory neighbourhood have already been shielded to prevent needless illumination of the night sky. Efforts have also been made to get special globes on street lights to filter out most of the blue light that is especially damaging to astronomical work.

The U. of T. has received remarkably good co-operation from the developers in the area. The latest example is a large development for which the University has worked with both town and development officials to hold 'light pollution' to a minimum.

"There's a lot of worthwhile research work for our telescope to do and we are eager

to keep at it", says Dr. Donald A. MacRae, the observatory's director. "Let's try to keep the starry sky as close as possible to its natural dark state."

Reprinted with permission from the
University of Toronto Bulletin
September 6, 1974

40th Annual Stellafane Convention

About a dozen members of the Ottawa Centre's Observer's Group and friends attended this year's Stellafane amateur telescope maker's convention, held near Springfield, Vermont. Even the lower U.S. speed limit did not deter us from making the 340-mile journey in about 6½ hours. Upon arrival on Friday night, August 9, we were immediately deprived of the $4 registration fee and $3 camping fee. Although this was the first year of the latter charge, it was by far the largest crowd of campers ever, possibly 1000 in number.

A recent record number of 43 telescopes was entered in the competition, including two from Ottawa. Dave Penchuk's 6-inch Cassegrain won first prize for compound telescopes, much to his delight and amazement. Rob Kick's 8-inch f/5 Newtonian unfortunately did not win the much hoped-for prize for optics. The Maksutov competition was just a little too much. Mr. Kalbfleisch of Toronto won first prize for Newtonians with his 12½-inch, repeating his performance at the General Assembly in Winnipeg.

Other noteworthy entries included a giant 14½-inch reflector, a spectrohelioscope which took all day to assemble and was ready at sunset, and a unique catadioptric design which won first prize in its class. This well-machined little telescope had the back of its mirror aluminized, the front surface acting as a correcting surface.

The Friday evening provided an opportunity for delegates to display their slides or to give informal talks under the big tent. On Saturday the telescope judging took place, and the more technical tent talks were listened to later in the afternoon. By Saturday evening most faces were sunburned, and the hill was occupied by those interested in the twilight talks. After the awards presentations, there were the usual addresses by Governor Johnson and Walter Scott Houston. Then the Sheephill amateur group gave an interesting presentation on observing.

After an almost sleepless Saturday observing night, we returned to Ottawa. We were not idle that weekend, and we hope to return next year.

—Reproduced from Ottawa Centre's *Astro Notes*

Astronomy for Campers

Project AFC was a summer work project sponsored by the Federal Government's Opportunities For Youth Program and carried out in cooperation with the Ministry of Natural Resources. The aim of the Project was to introduce astronomy into the interpretive programs of Provincial Parks in Ontario, with the hope of increasing the campers' awareness of the universe around them.

To fulfill this aim, Andreas Gada, Lawrence Cresswell, Richard McWatters, and Paul Mortfield, undertook a two month camping trip from June 10 to August 19, 1974. During this time we visited each of seven provincial parks twice, and presented fifty-seven programs on astronomy.

Two types of program were carried out during our stay in each park. During the day we held a program called "Observe the Sun," which consisted of displays, a mini course in astronomy and a telescope set up to view the sun. In the evening we gave our "Main Program" consisting of a movie, a slide show and a telescope demonstration.

The response was excellent. During the peak camping season we averaged 100 people per showing, although we reached a peak of 300 people for one of our "Main Programs" and 400 people for an "Observe the Sun" program.

In sharp contrast during the off season, late June, we often had only three or four people per show. Despite this slow start, over 4,000 people participated in our activities. Judging from some of the comments that were received, the campers seemed to have enjoyed our programs. As a result, plans are being made for an even better AFC for next summer, including better displays. As well, an improved version of this year's slide presentation will be joined by two new slide shows, "Benefits from the Sun" and "The Amateur Astronomer".

ANDREAS GADA, RICHARD MCWATTERS
Toronto Centre

1975 General Assembly

The 1975 General Assembly will be hosted by the Halifax Centre during the period June 27–29, inclusive. Further details will be provided in the near future.
Plan now to attend an exciting and memorable weekend of astronomical activities.

News Briefs

Astronomical Antiques Wanted

The National Museum of Man, History Division, is searching for navigational and astronomical instruments to illustrate a theme of early exploration in Canada for its forthcoming exhibition, opening in Ottawa in 1975.

Potential lenders, donors and vendors of relevant artifacts of the seventeenth to early nineteenth centuries are asked to contact:

The History Division
National Museum of Man
Ottawa, Ontario
K1A 0M8
Attention: Christine Grant
Artifacts Researcher

Toronto Centre Plans Major Observing Programme

The Observational Activities Committee of the Toronto Centre is organizing an amateur observing programme starting with the 1974–75 season. The projects involved have been chosen so that interested observers with any form of equipment can take part, and so that a poor sky does not disadvantage a particular site.

The studies are:

1) Observation of three variable stars, all of which are suitable for binoculars or finders, and do not become excessively faint. The variables are:
   a) δ Cephei – the prototype Cepheid variable. The study will involve determination of the period of variability.
   b) W Orionis – a semi-regular red variable, easily located in Orion. Not being regular, observation of its behaviour is always useful.
   c) RX Leporis – an irregular variable in Lepus, very near W Orionis and on the same AAVSO chart.
2) Study of the sky brightness in and around urban centres. This will involve the construction of portable visual photometers with a screen of adjustable brightness, allowing direct comparison with the sky brightness.
3) A study of the planet Jupiter, with particular emphasis on charting the motions of surface features. This, of course, requires a telescope and a particular willingness to observe.

To aid beginning observers interested in participating in these programmes, a series of expository manuals has been prepared – one for each of the three jurisdictions. These

manuals contain all necessary charts, tables and data as well as full descriptions of the methods involved. The variable star manual has the AAVSO star charts and Julian day calendar, while the photometry manual has plans for the visual photometer. The manuals are available from the address below. To cover publication costs, it is necessary to charge a fee of 25¢ for each manual.

Observers interested in participating in any of the studies in the programme are urged to contact the Chairman of the Observational Activities committee at the address below. It is hoped that the observers can be from as large an area as possible, to maximize both the quantity and continuity of the data. Also, starting in the spring, a number of people interested in doing data reduction will be required to help in the analysis of the results. This will likely involve the use of computers, and, in the case of the Jupiter study, the production of several maps and related items.

Success of the programme depends greatly on the number of observers participating, so it is hoped that many amateurs, at any level of experience, will take part.

ROBERT PIKE
OAC Chairman,
2515 Merrington Cres.,
Mississauga, Ont.
L5K 2B8

Light Pollution Programme

I would like to invite observers to participate in a programme designed to measure "light pollution" levels in Canada. The goals of this programme would be:

1) to determine how rapidly light pollution drops off with increasing distance from cities and populated areas;
2) to produce maps showing "light pollution contours" based on the data obtained;
3) to determine how Canadian skies compare with skies elsewhere in the world; and
4) to provide observers with means to measure their own skies *quantitatively* and to evaluate the quality of special observing sites with respect to light pollution.

The equipment the observer will need to construct is an extremely simple and inexpensive visual photometer. The programme will provide plans and some parts to observers. The measurements made will be accurate because each observer can calibrate his visual photometer against a precisely calibrated standard light source provided by the programme.

It will be important to have observers located in city, suburban, and rural areas; and observations must extend over several years to allow for seasonal effects.

If you are interested in participating in this work, please write to me at the address below, and I will send a full description of the programme and plans for a visual photometer.

This programme is to be carried out under the auspices of the Toronto Centre Observational Activities Committee.

RICHARD BERRY
3131 Highway #25
Palermo, Ontario
L0P 1L0

Metric Conference

The Conference Board in Canada is planning a Conference on "Conversion to the Metric System" in December 1974. We believe such a meeting will be timely and of interest to businessmen, government officials, union leaders, and others. Most of the speeches will involve issues that are of primary interest to the business community but the discussions should also interest a much broader audience.

Briefly, the intent of the Conference is to point out what is happening in the field, to show the advantages and disadvantages of metric conversion, and to encourage people to give close and continuing attention to both the advantages and problems of eventual conversion.

Anyone wishing further information should contact:

MR. G. T. CULDWELL
Senior Specialist
Management Practices
Suite 1800
33 River Road
Ottawa, Ontario
K1L 8B9

Eclipse Book

Eclipse in the Land of the Midnight Sun is a publication containing accounts of the 1972 solar eclipse as observed at Tuktoyaktuk, NWT by members of the RASC Calgary Centre's expedition. The booklet was compiled and edited by the expedition's organizer, Mr. John Findlay. Interspersed with interesting stories about the expedition and the eclipse are excellent examples of eclipse photography, some reproduced in full colour. This booklet is a fine addition to the library of anyone interested in observing eclipses or in recalling the events surrounding the last total solar eclipse seen in Canada.

Supplies of the publication are rapidly diminishing. Anyone desiring a copy should send $1.25 to:

The Royal Astronomical Society of Canada, Calgary Centre
c/o MR. J. A. FINDLAY
Centennial Planetarium
P.O. Box 2100
Calgary, Alberta
T2P 2M5

There are now 4 known 12½-inch telescopes being constructed by Ottawa members ... 3 of these people are under 16 years old!

—From Ottawa Centre's *Astro Notes*

Dues Still Due?

All members are reminded that their 1975 fees were due October 1, 1974. Members of Centres should remit directly to their Centre's Treasurer; unattached members should send their fees to the National Office, 252 College Street, Toronto, Ontario, M5T lR7. Please include your new postal code.

Fees are $12.50 regular and $7.50 for students *under the age of 18 years* as of October 1. As well, some Centres have special fees in addition to the above. Consult your local Treasurer for details.

Treasurers of Centres are reminded that all membership fees received up to December 31 must reach the National Office by January 15 in order to permit membership lists to be updated in time to mail the February *JOURNAL*. It will not be possible to retain membership and receive the publications of the Society unless such fees are received by January 15.

L'Envoi

The Editorial Staff of the *Newsletter* extends to all members our best wishes for a Merry Christmas and a happy and prosperous 1975.