NATIONAL NEWSLETTER

June, 1985

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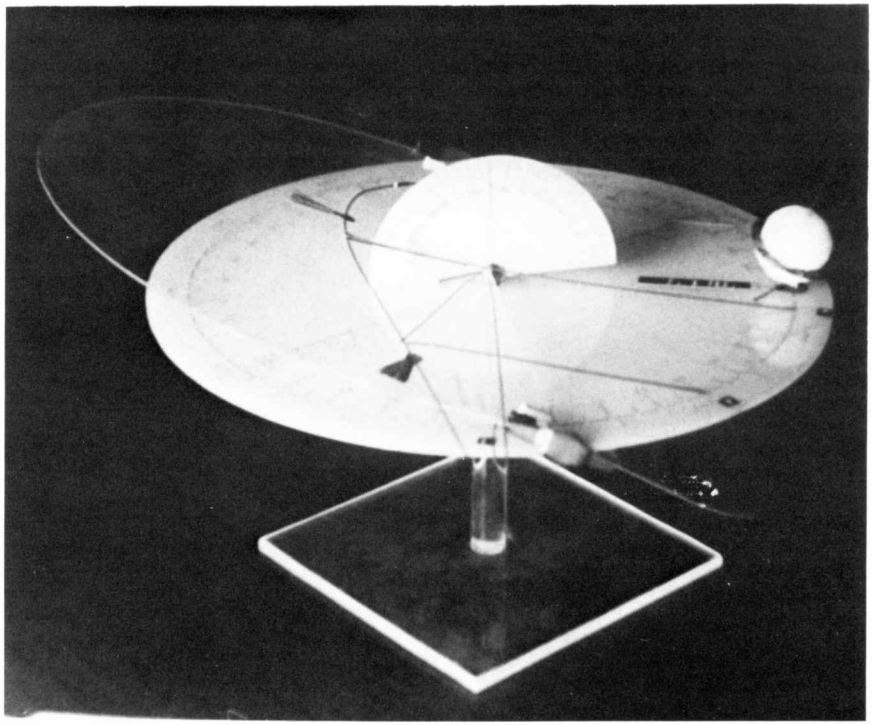

A plastic version of a three-dimensional model of the orbit of Halley's Comet near perihelion. A 2.2 cm diameter model of Earth shows relative alignment, but is of course much over scale. (About 1280 times too large.) *Photo by B. Franklyn Shinn*

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Editor: RALPH CHOU
Managing Editor: IAN MCGREGOR
Associate Editor: B. FRANKLYN SHINN
Assistant Editors: HARLAN CREIGHTON, P. JEDICKE
Press Liaison: AL WEIR

Redacteur pour les Centres français
DAMIEN LEMAY
477 ouest 15ième rue,
Rimouski, P.Q., G5L 5G1

Please submit all materials and communications to:

Dr. B. Ralph Chou
School of Optometry
University of Waterloo
Waterloo, Ontario
N2L 3G1.

Deadline is six weeks prior to month of issue.

Editorial

by B. Ralph Chou

In July 1980 at the General Assembly at Halifax, I was given the privilege of succeeding Franklyn Shinn as Editor of your *National Newsletter*. After 5 years on the job, it is time for a stock taking.

It has been a most enjoyable time, and a lot of hard work, to produce 6 issues per year. The editorial staff has been most diligent in searching out original articles for our pages, as well as selecting the best articles from Centre newsletters for your perusal. Perhaps the greatest disappointment has been the lack of material *en français* for the benefit of our francophone readers.

For the past few years, we have run an item called "Across the R.A.S.C." with which we hoped to provide news of Centre happenings. Unfortunately there has been little co-operation from the Centres in getting news to us in time to meet our deadlines. For the time being we will continue to prepare this feature, so please let us have your news.

No editor can escape criticism, and I am no exception. Most comments have been constructive, and I think they have helped to improve the NNL. I hope that you feel we have delivered value for your dollars, but please continue to let us know how we are doing.

The *National Newsletter* has changed greatly since its founding by Council some 15 years ago. Not only has it grown in size, but it has grown in content, too. Part of this growth has been due to a steady influx of new ideas and new contributors throughout its existence. We owe a great deal to my predecessors, Dr. John Percy, Norman Green, Harlan Creighton and Franklyn Shinn, for making the NNL what it is today. Most of the present staff have been involved with the NNL for a decade or more, and so it is time to pass the task along to someone else, and start again the process of renewal.

As I leave the Editorship, there are many people to thank. Ian McGregor, as Managing Editor, has been my indispensable right hand man, copy-editing, proofreading, and making sure everything went to press on time. Harlan Creighton has patiently prepared the annual index of articles – a difficult task. Franklyn Shinn has continued to supply interesting items and editorial advice. Damien Lemay and Peter Jedicke have also provided much assistance. Rosemary Freeman at the National Office, and Al Weir and his colleagues at University of Toronto Press have been very patient and helpful at keeping production as trouble-free as possible. Last but not least, thanks to you, the readers, for your comments, contributions and patience. Yes, it's been lots of work, but lots of fun too. I hope my successor will be as fortunate, *quo ducit Urania*!

Congratulations Ralph!

It is with great pleasure that we announce to the Society's membership that our *National Newsletter* Editor, Ralph Chou, was married on May 25 to Lucy Huang. On behalf of the *Newsletter* staff and the Society we wish Ralph and Lucy much happiness and clear skies always!

Nitrate You Say? Pity

by Dr. J.D. Fernie
David Dunlap Observatory

With an eye to forthcoming functions connected with the Observatory's fiftieth anniversary, I have been rummaging around our walk-in vault to see what ancient goodies might be resurrected for the occasion. Among the finds was a small roll of 35 mm movie film labelled "Paramount News footage of Observatory Opening. "I couldn't recall ever having seen or even heard about it before, but clearly it was worth investigating.

The obvious first step was to see what was on the film, so I thought I'd find where on campus the nearest 35 mm movie projector might be and arrange to have the film projected. (I guessed – quite correctly – that one didn't borrow such projectors; they turn out to be yards tall and hundreds of pounds in weight.) Five phone calls later I had established that the University of Toronto nowhere has a 35 mm projector; all to whom I spoke were firm on that, but less so as to where else a projector might be found.

Bill Clarke, however, came to my rescue with the name of Mr. Gerald Pratley, Director of the Ontario Film Institute over at the Science Centre. Mr. Pratley proved very genial and arranged to stay late at his office one afternoon and to have a projectionist on hand to roll the film. So I trotted round to the Science Centre, and in due course the projectionist prepared to load the film onto a reel. To keep the conversation going I noted the film was quite historic. The projectionist paused. "But not nitrate stock, of course?" I had no idea. He snipped off a couple of millimetres from the film leader and put a match to the sample. Up it went in a short, merry blaze. He carefully – very carefully – put the film back in its original container. "Do you realize," he said severely, "that I could lose my licence for just having handled that stuff? Do you realize that the heat of a modern projector would almost certainly set it off, and that once it goes it goes with such intensity that the average fire extinguisher has little effect on it? Do you know that the nitrate fumes combine with moisture in one's lungs to form nitric acid?"

I had visions of the Science Centre burnt to the ground, bodies everywhere with nitric acid dripping from their lungs. We withdrew chastened. Mr. Pratley, with a face of thunder, intermingling apologies with imprecations against all projectionists, marched us back to his office. I said I thought that perhaps I'd better just have the film copied onto modern 16mm stock without a preview. Mr. Pratley agreed, and to make up for my wasted trip, called a good film lab in the city, established a reasonable price, and made other such arrangements.

So it was that a few days later, film in hand, I went along Adelaide Street to Film House and asked for Mr. Norris. Mr. Norris proved as genial as Mr. Pratley. No problem. They copied 35 mm film onto 16 mm all the time. He held a strip of the film up to the light. "Looks quite old," he noted cheerily. Yes, I said, just on fifty years. His cheeriness faded. "But not nitrate stock, of course??" "Well, as it happens ..." I began. He carefuly – very carefully – put the film back in its original container. "Do you realize," he said, casting around for a broomstick to take to me, "that as you walked in the door with that film, the fire insurance on this building flew out the window? Are you aware that you could be arrested for even having it in your possession?"

But we of the criminal class know when to stand our ground. I bitterly regretted ever having taken the damn thing from the vault, and announced my intention of returning it there. "Are you crazy?" whispered Mr. Norris incredulously. "Do you know that stuff can spontaneously explode? It's blown doors off steel vaults in Ottawa!" I contemplated the horror of it all. Return it to the vault and blow up DDO, or throw it in the garbage and kill God knows how many public incinerator workers?

Mr. Norris took pity. There exists in Ottawa, he explained, the National Film Archives, and they are the only people in Canada who can legally own nitrate stock film. (They also maintain a philosophical attitude to blown up vaults, evidently.) In fact, they are eager to acquire historic film footage, and will without charge return modern copies to donors. Mr. Norris provided names and phone numbers.

Mr. O'Farrell at the National Archives was enthusiastic. They would indeed like to have the film; they only had four snippets of Canadian Paramount News footage in their collection, so this would be quite valuable. Did we have anything else? As it happens, we do – several early 16 mm reels of the building of the telescope, an eclipse expedition to Quebec in 1932 (attended by Mrs. Dunlap and family), and others. Ottawa would take the lot and establish the David Dunlap Observatory Collection in the National Archives. We'd get free copies on safety stock.

I explained to Mr. O'Farrell that I had to give a public lecture in a few weeks and would like to use the Paramount News film. How best to rush it to him in Ottawa? Ah yes – well! Nitrate, eh? It would be illegal to mail it, no courier service would touch it, but fortunately Mr. O'Farrell was driving to Toronto in a few days and would pick it up. (I'm glad he wasn't flying; no doubt attempting to board an aircraft with nitrate film appears in the law books somewhere ahead of attempted hijacking.) Mr. O'Farrell duly appeared and, literally with white cotton gloves, removed the films. I suppose he was driving something borrowed from the bomb squad.

His group was most helpful and worked hard to get the film I wanted back to me in time. He called just a few days before my talk to say they were sending it. "Great," I said, "I've slotted it into my talk to show the Observatory's Official Opening." "Opening?" he replied. "There's nothing about the Opening on it! It's before the Opening. Mostly an interview with some old chap."

A bit of a disappointment, since I was relying on that Opening footage, but the old chap of course was Dr. Chant, and for nearly all of us the film allows us for the first time to hear his voice describing the fulfilment of his dreams. I'm glad we have it.

And if the National Film Archives should be blown to smithereens some time, I shall of course feel sorry for Mr. O'Farrell et al, but I shall also consider that there, but for the grace of God, goes the DDO.

Reprinted from *The David Dunlap Doings*

Report of the January 1985 National Council Meeting

by Leo Enright
National Recorder

The first meeting in 1985 of the National council took place at the National Office on January 26, with ten of the Centres being represented by officers or representatives. The agenda included reports from officers and committees and a number of announcements.

The National Treasurer, Mrs. Fidler, presented a proposed budget for 1985 which was discussed by Council. An amount of $3000.00 was allowed for possible Travel Grants to the General Assembly in June, and a grant to the Quebec Centre of $350.00 from the Ruth Northcott Fund was approved for the

production of the *Almanach Graphique*. Ms. Robinson, representing the Property Committee, reported that the apartment above the Society's headquarters had been repainted, some new equipment had been installed, and it would soon be rented to new tenants. As editor of the *Observer's Handbook*, Dr. Bishop announced that 14,000 copies of the 1985 edition had been printed and over 10,000 had been mailed as of late January. Mr. Enright, the Astronomy Day coordinator, presented a package of information to assist centres in celebrating International Astronomy Day on April 27. As a representative of the Edmonton Centre, Mr. Loehde reported that plans were proceeding well for the General Assembly in the Alberta capital in June. Dr. Bishop informed Council, that as National President, he had made visits to four of the Centres, and had received invitations from several others.

Seven regular members of the Society were elected to life membership, and seventy-two recent applications for unattached membership in the Society were approved. Council also approved the Nominating Committee's suggestion of inviting Dr. Stephen Hawking, a noted British cosmologist, to become an Honorary Member of the Society. Dr. Arthur Covington, a pioneer in radio astronomy and solar activity studies, and member of the Ottawa Centre, will be invited to serve a four-year term as our Honorary President.

More complete details of all of the items discussed at the meeting may be found in the minutes of the meeting which have been distributed to all Centre Presidents and National Council Representatives.

Peru: Twelve Months Before Halley

by Jack Newton
Victoria Centre

I was invited by George Ellis, President of the Astronomical League, to travel to Peru as part of an expedition to lay the groundwork for a nonprofit Halley observation tour there in 1986. As technical advisor, I was to explore suitable sites for the observations, checking out prospective sites for ease of access, amenities in the surrounding areas, degree of background skylight, and suitability for deep sky observing.

The group included two travel consultants, Cynthia Crittenden from Travel and Transport (a Missouri-based firm) and Alma Schacht from Unique Adventures (a San Francisco agency). Dan Brocious, an archeo-astronomer from the Smithsonian's Fred Lawrence Whipple Observatory, George Ellis and I completed the tour roster.

We rendezvoused in Los Angeles on April 6, and arrived in Lima, Peru, the following day, where we were met by members of the Peru Astronomical Association (APA), and Gustavo Estremadoyro, the Planetarium director. We toured Lima, including the marvellous Gold Museum, Museum of Anthropology, the Planetarium and APA's observatory, which is presently under construction.

The following day, we flew to Cuzco, a very picturesque city perched some two miles up in the Andes mountains and surrounded by green rolling hills on all sides. It is a charming Inca city, with many of its present-day buildings constructed on the original walls of ancient Inca ruins. The observing site in this area is itself an Inca ruin, only a few kilometres outside Cuzco.

We took a side trip to Machu Picchu, the world-famous Inca ruin which managed to escape discovery by the conquering Spanish, and therefore provides fascinating clues to the culture and history of the region.

The trip to Machu Picchu is prefaced by one of the most spectacular train rides in the world. The train leaves Cuzco and travels through the Urubamba River valley, snaking past the river, which is the longest tributary of the Amazon River. The Urubamba River thunders through gorges and boils with white water which would cause the most avid whitewater adventurist to turn pale! The snow-capped peaks are spectacular and the unusual topography spotted with Inca ruins. Buses ferried us the final short distance to Machu Picchu, where we spent a good deal of time scouting about the ruins. The interesting site was crowned with an observatory constructed by the Incas and named "Torreon." From this observatory, records were kept of the winter solstice sunrise (June), the rising of Collca (Pleiades) which heralded the planting season, and the solar zenith passage.

After three very enjoyable days in Cuzco and the surrounding countryside, we departed for the principal Halley viewing site, near the town of Arequipa. Arequipa is approximately 885 kilometres to the south of Cuzco. This area offers both a small town with its attendant facilities and some of the best viewing sites anywhere. We chose two sites; one close to the town and one which is more remote. The locations both offer a dark eastern horizon. The site which is closest to Arequipa is only a few kilometres outside the town, and it is planned to offer an hourly shuttle bus service to and from it next spring while the Halley viewing is under way. The more remote site is about 48 kilometres away, and should prove to be an excellent site for the avid deep-sky observer and astrophotographer alike. George Ellis and I found it a strange sight indeed to view Sirius at the zenith and Orion "upside down." Not only that, but because we were all keeping our luggage to a minimum and photography equipment as light as possible, George and I spent most of our time wrestling over his 8-inch f/5 refractor!

A few miles outside Arequipa we enjoyed a visit to a meteorological station operated under contract from the Smithsonian Institution. The station uses a 50 cm telescope and laser to record precision distances from its location to orbiting satellites. It fires a laser burst sixteen times daily and picks off a 40 cm diameter satellite, recording the returning flash through the telescope. The station also houses an 80 cm Baker-Nunn camera, which has been mothballed for the past three years. I hope to obtain permission to use it for photographing Halley next year.

The spring of 1986 is fast approaching. I'm looking forward very much to the liaison with the APA and a continuation of this spectacular journey, in the company of friends both old and new.

Finding Comet Halley by Projection Blinking

by Ben Mayer

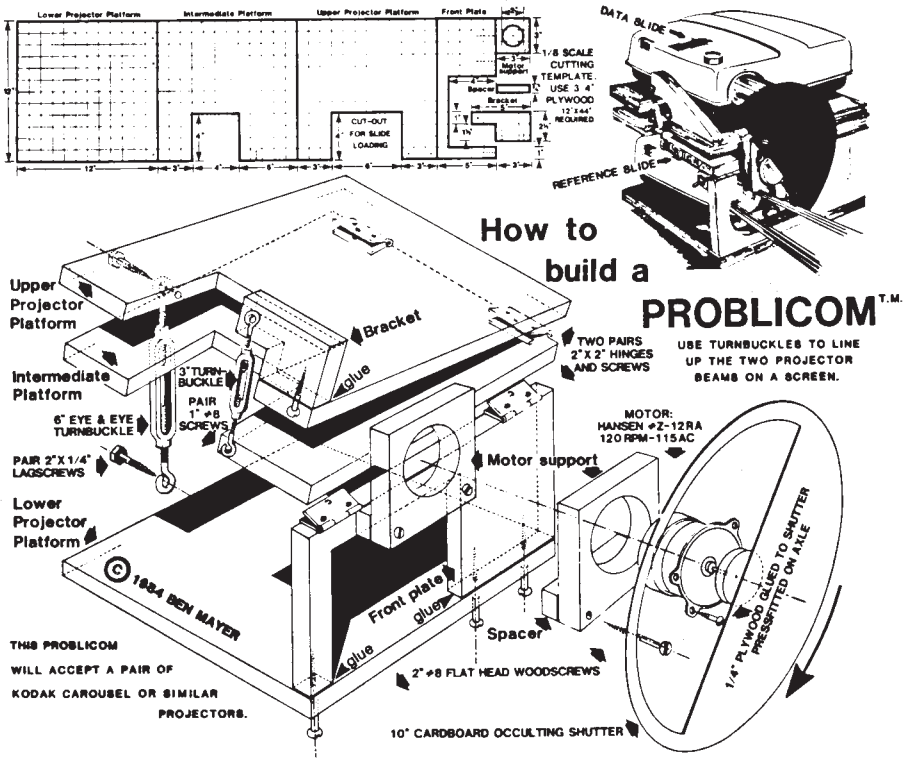
There is a method which enables us to find Halley's Comet at the earliest possible date, a system which allows starting our quest tonight or on any clear (moonless) night from now on. The way to achieve earliest results is to begin photographing the areas in which we know, even now, that the historic comet will be found on any given night from here on forward.

The invaluable second edition of the *Comet Halley Handbook*, an *Observer's Guide* (available from the U.S . Government Printing Office and other booksellers), presents an accurate Ephemeris for Comet Halley at One-Day Intervals from August 1984 to May 1987. Start by selecting target areas to photograph during the most favorable times of the coming months (centered on the dates of the new moons). Seek out a location from which to take your photographs, as far away from city lights as possible. Select the equipment you plan to use throughout your search and the type of film which you plan to employ henceforth. In order for all photographs to be as identical as possible for later comparison, site selection, film emulsions, exposure times, seeing conditions, etc. should be recorded in a log for subsequent replication.

All that is needed to re-discover Comet Halley for yourself is a pair of negatives or a pair of color slides. Whether you work with an eight-inch Schmidt camera using gas-hypered 2415 Technical Pan film or a homebuilt 14-inch Newtonian with some new color film pushed from 1600 to 3200 ISO, you can soon establish the potential reach of your equipment by calibrating it with the help of the charts provided in *Sky and Telescope* (January 1984, p. 28). This will help find your telescope's magnitude limit. Together with the projected but approximate magnitudes in the *Halley Handbook*, you can now estimate the approximate date when your search may be crowned with success, and when to photograph your second "data" picture.

Why do we need a *pair* of photographs? Let us say we shoot the region centered on R.A. $6^h\ 03^m$, Dec. + 19°07′ at any time between tonight and Aug. 16, 1985. We will then hold a "reference" record of the precise area where Comet Halley will be on the New-Moon night of the third weekend in August 1985. If our tests concerning magnitude have shown that we can record images to 14th magnitude, then any identical photograph taken on, or near Aug. 16, 1985 will not only contain the myriad stars of the Milky Way in Orion, but also the first glimmer of our elusive solar system wanderer. We know almost exactly where to look in our Aug. photograph for the image of 1982i, known as "Periodic Comet Halley," but to establish exactly, beyond the shadow of a doubt, the identity of our comet, we need to

check our August picture against our reference slide taken previously, perhaps as early as tonight. It certainly is not going to be in any photographs taken of the $6^h\ 03^m$, + 19°07′ spot before the August date. However if we compare the "reference" photo with the "data" record, Comet Halley can attract immediate attention to itself by "blinking." It would be the 10001st object in the data slide where the



reference slide only showed 10000. What is needed is a "PROBLICOM," a *PROjection BLink COMparator*.

By alternately projecting the pair of slides through a pair of slide-projectors, using an occulting shutter which presents first the reference slide and then the data slide to viewers in rapid succession, the comet will blink on and off, thus making its position known immediately. Such a device needs only a 120 RPM motor and a simple rack to stack projectors on top of each other as shown. In *Sky and Telescope* (September 1977, p. 246–9) and in *Astronomy* (May 1978, p. 34–7) there are explanatory PROBLICOM articles. The book STARWATCH (Putnam Publishing) by Ben Mayer gives diagrams reproduced here by permission.

Another simpler and less costly way for comparing pairs of slides to find Comet Halley is with a "STEBLICOM," a *STEreo BLInk COMparator*. Such a unit was described by H. Lazerson in *Sky and Telescope* (March 1984, p. 275). It should be possible for most hobbyists to build a STEBLICOM. Two 6–8 power magnifiers held by a yoke about 65 mm apart (on center) can serve in place of the binocular viewer. Such blinking devices are also commercially available and are advertised in astronomy magazines.

Eventually, in October 1985, the comet will come within reach of 135 mm telelenses mounted on equatorial drives (or piggyback on "driven" telescopes). At magnitude 5.8 in early January 1986 anyone with a 35 mm SLR camera should be able to find Comet Halley via a pair of slides shot 24 hours apart with unguided 15–20 second exposures taken from reasonably dark sites removed from city light pollution. Standard 50 mm lenses with "speeds" of f/1.4–f/2.0 combined with the fast new color emulsions should make the 1985/86 appearance of Halley's famous comet the best recorded cometary event in astronomical history.

Now Where Is That Comet?: Building a Simple Model of Comet Halley's Orbit

by B. Franklyn Shinn
Victoria Centre

Cast your eyes over these figures:

T = 1986 Feb. 9.45174 (E.T.) i = 162.2
Ω = 58.1 q = 0.59

Date	Δ	r
Nov. 10/85	1.75	2.22
Dec. 20/85	0.92	1.19
Jan. 30/86	1.55	0.63
Mar. 20/86	0.81	0.99

If you immediately think "Oh yes, they are the orbital elements for Comet Halley!," and a picture of the comet's orbit comes to mind then you probably don't have to read further. For many people these numbers have little meaning. But there is a way to make these numbers into a scale picture or model of the movement of Comet Halley that can be amusing and a conversation piece and you don't have to be a physics expert to do it!

First, a brief explanation of what the numbers and symbols represent:

T = 1986 Feb. 9.45 174 (E.T.) is the date when the comet will be closest to the Sun (the perihelion date)
Ω = 58.1 is the angle around the Earth's orbit starting from the March or vernal equinox to the point where the comet crosses the plane of the Earth's orbit and enters the northern celestial hemisphere (the longitude of the ascending node)
i = 62.2 is the angle between the plane of the Earth's orbit and the plane of Comet Halley's orbit (the inclination of the comet orbit)
q = 0.59 is the distance of the comet from the Sun at perihelion in terms of the astronomical unit (abbreviated A.U.) which represents the Earth-Sun distance
Δ = the distance of the comet from Earth at a given date in astronomical units
r = the distance of the comet from the Sun at a given date in astronomical units.

The basic materials for the model (see cover photo) are two sheets of cardboard or plastic. Cardboard is easy to work with but you need a new model for any other comets you consider. In plastic, a construction can be fabricated that is capable of adaptation to other comets and can be more permanent.

One sheet will represent the Earth's orbit about the Sun. It should be large enough to contain a circle 20 cm in radius. The centre of the circle represents the position of the Sun, and within the accuracy of construction the circle represents the orbit of the Earth. We can divide this orbit into twelve segments each 30-degrees in angular measure, and we have twelve monthly positions. Now pick a point

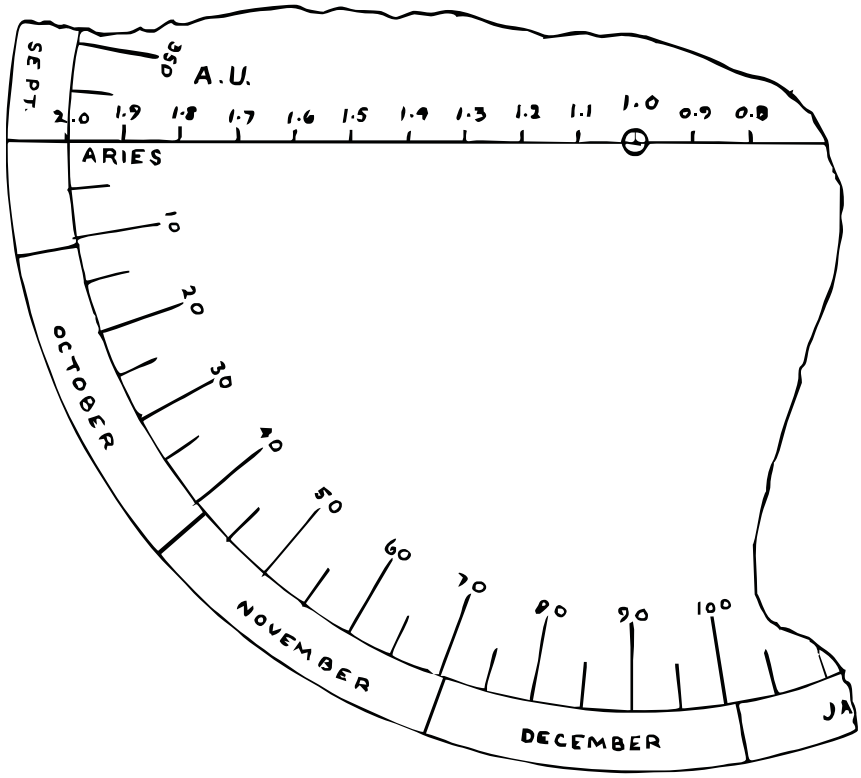


FIGURE 1. Earth orbit plane marking

20-degrees counterclockwise from one of the marks and label it March 21, the March or vernal equinox. This also represents our 0-degree starting point. Draw a diameter across to the other side of the orbit and label this September 21, the September equinox. This line is important in setting up our model.

It is a good idea to divide this line into 10 units, each 2 cm long, from one side to another. In our model 20 cm (the radius of the circle) represents one astronomical unit (one A.U.), the Earth-Sun distance. By marking every 2 cm along the line we have provided ourselves with a scale that will easily enable us to measure for our model.

Now label in the months going counterclockwise (as we Northern Hemisphere Residents view things) and label the 30-degree divisions counterclockwise from 0 to 360-degrees with March 21 representing our starting point of 0-degrees (Figure 1).

The second sheet requires material about as large as the first sheet with at least one edge a straight edge. The straight edge is placed across the Earth's orbit with its middle placed at the Sun's position and the edge meeting the Earth's orbit at a point 58-degrees counterclockwise from the vernal equinox. This is where the ascending node of Comet Halley's orbit is located.

If plastic sheets are used it is convenient to hinge the two planes together at the central (= Sun) position. One way of doing this is illustrated in Figure 2. A cap nut can be threaded onto a suitable length of threaded rod, say 2.5 cm long and then drilled transversely, so that a length of brass wire

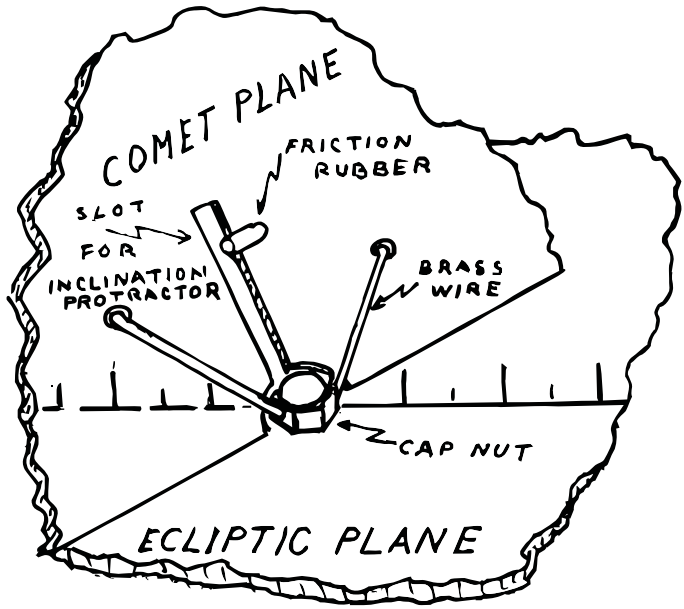


FIGURE 2. Method of hinging comet plane to ecliptic plane

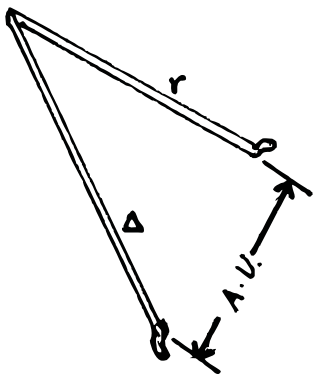


FIGURE 3. Typical wire triangle

passed through the drill hole can be used to attach the plastic sheet representing the comet orbit plane. The Earth-orbit sheet has a hole drilled centrally, and the cap-nut-threaded rod is used as a bolt to hold the two planes on a suitable pedestal. If the bolt is not tightened too much the earth orbit plane can be rotated to any desired position for a particular comet.

To hold the comet plane at the required angle of inclination, a slot can be cut in it over the central position, and a protractor labelled counterclockwise passed through it. If one positions this so that one views the calibrations, the ascenting node of the comet is towards the builder.

Having set the two planes at the required relationship, the ascending node by the angle from the line of the equinoxes, and the inclination by the angle from the equatorial plane to the comet plane as viewed from the ascending node, all that is left to do is to find out where Earth and the comet are located on successive dates.

In this model we are not directly concerned with the elliptical orbit of the comet. Rather we identify three points which form a triangle for any specified date. The Sun's position is fixed, the Earth's position for any date can be located along its orbit, and the comet's position is specified by its Sun-comet distance and Earth-comet distance for any specified date. In a more permanent form (Figure 3) this triangle can be made by bending brass wire to the appropriate lengths for the sides Δ and r, and inserting them in holes nearest to the position of the Earth and the Sun for a specified date. The bend of the wire will mark the position of the comet. Make a few more wire "triangles" for other dates with the appropriate sizes and you will find a series of points along the comet plane which indicate the position of the comet for various dates. Curve another piece of wire along these points and hold it in place with Scotch tape to indicate the orbit of Comet Halley.

Now we know where to find the comet!

Note: Orbital elements are from the IWH *Amateur Observer's Manualfor Scientific Comet Studies*, Part II, published by NASA. The description used is deliberately not specific as readers may have their own skills and materials and can adapt to their own wishes.

Across the R.A.S.C.

NIAGARA: The Spring Banquet was held on April 12 at the Skylon Tower. A large library display was set up at the St. Catharine's Centennial Public Library during April. Six members participated in a March 20 "Messier Marathon" under clear skies. The Centre has planned two mall displays and three public star nights between May and September.

LONDON: Commander Marc Garneau, first Canadian to go into space and astronaut Dr. Roberta Bondar gave a public presentation on the Canadian astronaut programme in London in March. Over 1000 people were in attendance.

WINDSOR: The Centre's 40th Anniversary Banquet was held at the University of Windsor's Vanier Hall at the end of May. To help promote the Centre a quantity of 40th anniversary souvenir mugs, blue in colour with the R.A.S.C. logo in gold, were produced for sale. Guest speaker was Dr. Orren Mohler of the University of Michigan. Randy Groundwater, the Centre's Director of Observations, reports a successful star party was held in late April at Wheatley Provincial Park to replace the clouded-out Messier Marathon in March.

TORONTO: A formal 10-week course in telescope making was organized in the spring and attracted over a dozen participants. Astronomy Day activities were planned for Toronto City Hall and the Ontario Science Centre. The Centre's membership has now exceeded 800 members entitling the Centre to a fifth delegate on the Society's National council. Monthly Members Star Parties are being held inside Toronto to provide some encouragement for younger and beginning observers. The Annual Picnic will be held September 21 at the Schomberg Observatory and the Annual Banquet on October 26.

VICTORIA: Jack Newton travelled to Peru earlier this year to survey Halley viewing sites. His address has also changed again since the April *National Newsletter*. Jack's new address is: 801 Stanehill Place, R.R. #1, Victoria, British Columbia V8X 3W9. Members will be setting up their telescopes at the Dominion Astrophysical Observatory for the public beginning August 7.

HALIFAX: The Centre has proposed a scheme to provide a lecture on astronomy for groups located at sites more than 100 km from Halifax. An individual makes the room/site arrangements, arranges dates and organizes publicity and the Centre provides a speaker and picks up the transportation costs. The

May–June *Nova Notes* is a special Halley's Comet issue and contained eleven articles on comets in general and Halley's Comet in particular. The Annual Banquet was held May 10.

CALGARY: Astronomy Day was celebrated on April 27 by a display of telescopes and computers plus talks at the Calgary Centennial Planetarium. The Second Annual Camping Outing will be held July 19–20 at Camp Gardner.

HAMILTON: Due to some communication problems between the Centre's Board, newsletter, and various groups and individuals in the Centre (something very common in all-volunteer organizations!), some major changes are being made in the Centre. More emphasis will be placed in the *Orbit* newsletter on reporting Centre meetings and activities, observing activities will get a higher profile, reports on Board discussions and actions will appear, and a major publicity campaign launched.

KINGSTON: After 5 of 6 planned star parties last autumn were clouded out, a new system was set up for this year in which a block of dates were designated as observing evenings around the time of New Moon. The Fort Henry Parking Lot has been the chosen site for these sessions.

OTTAWA: The March *Astronotes* contains an article by Fred Lossing titled "Inexpensive Photometer for Amateur Astronomy" which updates an article by the same title which appeared in the R.A.S.C. *Journal* (Vol. 72, No. 1, February 1978) and improves the instrument's performance. Rolf Meier attempted to photograph Comet Halley in March using the Centre's 16-inch telescope and a homebuilt PROBLICOM (a PROjection BLInk COMparator). The comet was too faint to be picked up but the blinking picked up other possible objects going down to the 18th magnitude. An article on PROBLICOM appears in this issue of the *Newsletter*.

Has a recent or upcoming event which would be of interest to our members across Canada and other parts of the world gone unreported or unannounced in the *Newsletter*? It could be no one notified us. Please continue to send Centre news to the *Newsletter*. Deadline for October issue is August 1.

Keeping the R.A.S.C. on Time

by Harlan Creighton
Assistant Editor

Visitors to the National Office in recent months have no doubt been impressed with a beautiful addition to the furnishings. Mounted on one of the walls in the office of our Executive Secretary, Rosemary Freeman, is a fully-restored, antique railway clock. The clock was presented to the Society on a "permanent loan" basis by Canadian Pacific Limited at the 1984 General Assembly.

The clock symbolizes a very important link between astronomy and the railways. Until about twenty years ago, astronomical observations provided the basis for establishing an accurate source of standard time in Canada. The railways required accurate time so that the operations of their trains could be synchronized. Railway employees involved with train operations were required to carry precision watches which had to be compared with a master clock at division points. All but the smallest stations were equipped with a high-quality pendulum clock which the station operator checked daily for accuracy against time signals that were broadcast from the Dominion Observatory over telegraph lines at a specified time each day. The availability of such a source of accurate standard time enabled the railways to make huge advances in the safety, speed and capacity of their services.

The clock in the National Office has another significance: it honours one of our members who played an important role in the development of the Canadian time service. He is Malcolm Thomson, who served as our National President during 1966–1967. He became Chief of the Astronomy Division of the Dominion Observatory, and following the amalgamation of all government astronomical research under the administration of the National Research Council, was appointed Head, Time and Frequency

Section of the Physics Division of the N.R.C. Many members no doubt have read his book, *The Beginning of the Long Dash*, published by the University of Toronto Press in 1978. The book outlines the history of timekeeping in Canada.

Initial correspondence with Canadian Pacific was with regards to a station clock, similar to those that graced the wall of many of the CPR's stations. Canadian Pacific used both spring-driven and weight-driven clocks, and preference was expressed for the superior weight-driven model.

Much to everyone's surprise, Canadian Pacific came up with a weight-driven comparator clock. This type of clock is now very rare, and was used as the standard clock for an entire division. Canadian Pacific spared no expense in fully restoring this magnificent instrument, and the Society is deeply indebted to the Company for its efforts and generosity on our behalf. Special thanks are due to Mr. Robert Rice, General Manager, Public Relations and Advertising; and Mr. Omer Lavallée, Corporate Historian and Archivist, for their considerable efforts in connection with this project. Everyone present at the General Assembly in Hamilton will long remember Mr. Lavallee' s informative and entertaining paper, the text of which he has kindly allowed the *Newsletter* to publish.

Like the Dominion Observatory, the old railway station clocks are now a thing of the past, although the writer and unattached member Richard Winiarz were surprised and delighted to see a comparator clock similar to the Society's in operation in the station at Field, B.C., in February, 1985. The time signals are still broadcast to the railways, but now they come from the Time and Frequency Section of the National Research Council of Canada. However, thanks to the generosity of Canadian Pacific Limited, a particularly fine example of a railway clock has been preserved and now hangs in our National Office to remind us all of the historical link between astronomy and the railways, and the important contributions of Malcolm Thomson to Canadian timekeeping.

Canadian Astronomy News

Space Station Agreement: In April the Canadian government signed an agreement with the United States National Aeronautics and Space Administration (NASA) for the conduct of a cooperative study on a permanently manned Space Station. For the first year of the two year agreement Canada has approved $8.8 million. Canada's contribution to the project would be a space-based service station (complete with refuelling tanks, bays for space tugs, and spare part storage compartments), a solar array power source, or a remote sensing facility. NASA has also signed agreements with the European Space Agency and Japan. The space station will be more than 130 m long and would begin operating in 1994.

Another Leap Second: On the last minute of the last hour of the last day of June a second will be inserted into the atomic clocks at the United States Naval Observatory in Washington, D.C., and at the National Bureau of Standards in Boulder, Colorado. This is done to keep the atomic clocks, which are accurate to within a billionth of a second per day, synchronized with sidereal time based on the rotation of the Earth which is accurate to within one-thousandth of a second per day. Leap seconds have been added twice in 1972 and once in every year since except for 1980 and 1984.

Science Writer Recognized: Congratulations to Terence Dickinson who won a Canadian Science Writer's Association award in May for an article he wrote on Canadian studies of galaxies which appeared in *Equinox* magazine. Dickinson has also been writing a weekly astronomy column in the Toronto Star newspaper for the past four years and is the author of several books.

Oops!: In the April *Newsletter* page L29, the wrong Dr. Chant was identified with the David Dunlap Observatory. Dr. Clarence A. Chant, the first editor of both the Society's *Journal* and the publication which was to become the *Observer's Handbook*, was the person who played the leading part in the development of Canadian astronomy and the founding of the Observatory.

Conference and Special Events Calendar

JULY 11–14
The Study of Variable Stars Using Small Telescopes
This symposium forms part of the celebrations for the 50th anniversary of the David Dunlap Observatory. Hosted by the Department of Astronomy of the University of Toronto, the event is intended for both amateur and professional astronomers. Contact: Dr. John R. Percy, Department of Astronomy, University of Toronto, Toronto, Ontario M5S 1A1.

AUGUST 9–11
Statfest '85
The fourth annual convention/camping weekend hosted by the North York Astronomical Association will be held at the River Place campground, 14 km north of Mount Forest, Ontario. Contact: Andreas Gada, 701-145 St. George Street, Toronto, Ontario M5R 2M1.

AUGUST 15–19
Mt. Kobau Star Party
A site recognized as one of the finest astronomical observatory sites in Canada will be the location of the second annual Mount Kobau Star Party hosted by the Okanagan Astronomical Society. The programme includes a telescope making competition, an astrophotography contest, twilight speakers, swap tables, tours of the Dominion Astrophysical Observatory, and of course, evening observing. Advance registration is requested. Contact: Peter Kuzel, 4100 25th Avenue, Vernon, British Columbia V1T lP4.

AUGUST 17
Stellafane
For information on this largest gathering of amateur astronomers in North America held annually in Springfield, Vermont, contact: Dennis di Cicco, 60 Victoria Road, Sudbury MA 01776.

AUGUST 19–23
Symposium on Science and Society
The First Joint International Physics Symposium on Science and Society in the Technological World will be held in Winnipeg, Manitoba. With the theme "Teaching physics in a Technological World", the symposium is hosted by four organizations including the International Council of Associations for Science Education, the Canadian Association for Science Education, the Science Teacher Association of Manitoba, and the Manitoba Ministry of Education. Contact: First Joint Physics Symposium, Manitoba Education, 409-1181 Portage Avenue, Winnipeg, Manitoba R3G 0T3.

Decalogue for Stargazers

by John Sanford
Hamilton Centre

Thou shalt not shatter the darkness at the observing site.
All man-made lights shall thou eschew, except faint red ones.
May he who violateth this rule be simultaneously plagued with coma, misalignment, forgotten eyepieces, diarrhea, and mosquitoes.

Carefully shalt thou walk, taking pains not to stumble over power lines, telescope legs, rattlesnakes, and sleeping babies.
Thou are at liberty to break thine own neck, but thou must never jostle a piece of equipment.

Thou shalt not raise a dust cloud with thy clumsy clodhoppers.
Neither shalt thou "burn rubber",
Or "lay scratch" with thy hot rod,
even though thy best girl is watching thee.

Toot not thy horn, race not thy motor, expose not with loud talk, thy tonsils to the night air.
Even as the condemned man sayeth, "No noose is good noose", So sayeth the observer, "Noise annoys".

Long shalt thou think before thou asketh to borrow thy fellow observer's equipment. Is thy request reasonable?
A screwdriver, perhaps. A Telescope? Preposterous.
Wouldst thou ask to borrow a corpse at a wake?

Praise thy fellow observer's equipment. Even when thou findest naught of merit, thou canst at least laud the colour of the paint,
and the darkness will absolve thee from lying,
But keep a straight face, for verily, a straight face is the shortest distance between two deceptions.

Thou shalt not disturb anyone who has his eye glued to a telescope ocular.
His mind may be light years away, exploring cosmic mysteries, and unscrewing the inscrutable. Or he may be "tracking a photograph".
This photograph will probably turn out badly, but please permit the poor "misguided" photographer of spoiling his own picture.

Respond not helter-skelter to Nature's urgings. East is girl's and west is boy's, and never the twain shall meet.
And whosoever male surpriseth a female on the same errand, he shall say, "I beg your pardon, sir", with emphasis on the "sir".

Squabble not with thy wife. If she sighteth a flying saucer, belittle not her judgement, but help her count the little men, lest she seek a more agreeable companion. Although the plural of mouse is mice, and the plural of louse is lice, the plural of spouse is not spice, it's bigamy.

Thou shalt clean up the observing site before thou leavest.
A sense of civic duty befits one associated with amateur astronomers, whose proud motto might well be, "We try harder, because ours is only the second oldest profession."

Reprinted from *Orbit*

The First Celestial Navigators

by Ron Walsh
Halifax Centre

Thousands of years ago man used the stars to help navigate the vast oceans. Even with today's sophisticated navigation satellite networks there are those who still prefer the old ways. But our fine feathered friends, the birds, may have had a big jump on us. They find different points on this planet using the stars as markers.

In recent times, some of the astounding methods used by the class *Avies* to get around have come to light. The shorter length of autumn daylight hours may be enough to trigger the migratory instinct. The distances birds travel in migration may vary from a few hundred feet, for populations that live high in mountains and move to the valleys for the winter, to 17,000 km for certain seabirds.

A German ornithologist, Gustav Kramers, experimented with a species of warbler (a small bird). Putting the birds in a rotatable circular cage and then exposing it to the night sky, he found that the birds constantly fluttered in the direction of normal migration. When denied a visual sighting on the stars, the birds fluttered in random diretions. They were then exposed to planetarium skies rotated 45, 90 and 180

degrees from true north. The birds responded by altering their directions to conform with the navigational information given by the stars.

A Cornell University ornithologist hand-raised a number of indigo buntings for a similar type of experiment. He found that young birds failed to orient well if denied visual experience of the sky until fall. It appeared that the young buntings not only learned the night sky, but in particular that part of the sky which shows the least rotation; the circumpolar sky. He also had the birds treating Betelgeuse as if it were Polaris simply by rotating the planetarium sky around that particular star.

The sun can also play an important part in bird migration. Results of additional experimentation with caged starlings which were in the migratory state appeared to prove this. The birds oriented themselves with the angle of the sun when leaving specially designed cages. The normal migratory direction was taken until mirrors were placed in close proximity to the cages, deflecting the sun's rays into the cages at different angles. The birds left their cages in a correspondingly wrong direction at approximately the same misplaced angle of deflection. It took the birds some time to shake off their confusion and re-orient themselves.

The homing pigeon is among the best of avian navigators. Taken from its home in any direction and any distance, it can almost certainly find its way back to the roost. One theory that may explain the uncanny navigational ability of this particular group of birds is the "sun-arc" theory. When the bird finds itself at an unknown location, it observes the sun. After release it will fly randomly or in a circle for a period of time. It will then measure that short part of the sun's movement along its arc. (Note: measure in this case means the bird's ability to distinguish two points along an arc). The bird extrapolates from that segment to determine the sun's highest position. Using its internal clock the pigeon determines the sun's progression along the arc. The bird then compares the two values (noon altitude and progress) with the values it remembers from home. The outcome is now quite simple, at least for the bird. If the sun's altitude is too high, the bird knows that it is south of home. If the sun is too far along the arc, it is east of home. The bird will then fly northwest until the sun's values are correct or one could simply say "the bird would fly in such a direction that would put the sun in the proper position at the proper time for its home location". The altitude of Polaris above the horizon and the degree of westward rotation of the star field could be used in much the same manner.

Another amazing fact is that birds recognize constellations . Another experiment with captive indigo buntings in migratory restlessness during the fall, was used to determine whether birds rely on particular stars as cues for orientation. The birds were exposed to a planetarium sky identical to the outdoor sky at the time of the experiment. The birds oriented themselves well in the planetarium sky. The sky projected was then reversed. The birds then fluttered in the reverse direction, validating the planetarium sky as holding some cue for orientation. What was it? To answer this question, different stars and constellations were successively blocked from view. The buntings continued to flutter in the right direction until the Big Dipper and the North Star were blocked from view. At this time they were noticeably disoriented. Thus the evidence seems to favor the Big Dipper in relation to the North Star as the cue to direction-finding in the night sky.

Adelie penguins, when moved from their breeding colonies at Cape Crozier on the coast of Antarctica to the far interior, oriented themselves by the sun and departed in one direction, ultimately returning to their nesting sites. The birds headed straight for the coast on essentially parallel courses without any convergence on Cape Crozier. Apparently the birds, when released, had no information on the nest sites. They took their direction from the sun and maintained that direction by the sun's azimuth.

Ah! but "alas" you say. What happens on a bad day, or an overcast night when the birds cannot obtain a visual sighting on the sky? It is quite simple. The penguins mentioned above became totally disoriented. As for the species of nocturnal migrants, if the ceiling is not too high, they will try to fly above the overcast in an attempt to view the stars. Those that cannot will either land or continue to fly under the clouds. In this case confusion usually sets in and the birds fly into TV towers or tall buildings with the predictable outcome.

Man has studied, watched and worshipped the sky for thousands of years, with Columbus and the Norsemen navigating the oceans with their primitive compasses and the stars. The ancient Egyptians used the rising of Sirius as a signal to plant crops. It is almost paradoxical to think that an epoch before this, thousands upon thousands of little eyes were trained on the sky for much the same reasons. So, if you are ever called a birdbrain, consider yourself as having been complimented!

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