
NATIONAL NEWSLETTER

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Messier 27, the Dumbbell Nebula, in the constellation of Vulpecula is a well-known example of a planetary nebula. Discovered by Charles Messier in 1764, the nebula may have formed about 48,000 years ago. Prime focus photograph using a 10-inch *f*/6 Newtonian telescope and 24 minutes on hypered 2415 film. *Photo by Bryce Heartwell.*

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Deadline for October issue is August 1.

Observing on the Kuiper Airborne Observatory

by Neil Rowlands
Edmonton Centre

This past July I was very fortunate to spend two nights observing on the Kuiper Airborne Observatory (KAO). As a graduate student at Cornell University, I have joined a research group, led by Drs. T. Herter and J. Houck, which makes regular trips on the KAO. This is a dream come true for me as I have been interested in astronomy since junior high school (when I joined the Edmonton Centre) and although my undergraduate work in Engineering Physics at the University of Alberta left little time for this hobby, it is now becoming my full time occupation.

The observatory consists of a 91 cm telescope mounted in a NASA C-141 transport plane. The KAO is based at NASA Ames Research Center at Moffett Field, California, which is located at the southern end of San Francisco Bay. The KAO is operated much like other major observatories, in that anyone can apply for observing time and funding to make observations. This observatory is special though, because it allows access to the medium and far infrared wavelengths which are normally blocked from reaching the ground by water vapour in the atmosphere. The C-141, however, flies at an altitude of 12.5 kilometres, above most of the water vapour (and clouds). Observations can be routinely made from the plane which cannot even be attempted from the ground.

The telescope is mounted on an air bearing which is fed by pressurized nitrogen (the nitrogen is stored on the plane in liquid form and is supplied to the mount by compressors). The mount maintains the telescope orientation by reference to gyroscopes, and is of altazimuth type. The incoming light enters the aircraft through a movable (in the altitude direction) open aperture on one side of the airplane just behind the cockpit. It then reflects off the primary mirror to a secondary mirror and thence to a third

mirror which sends the light down the telescope altitude axis and into the control area of the plane where the experimenter's instruments are placed.

The range in azimuth is provided by the heading of the aircraft. Thus to look at an object, the plane must fly in a direction perpendicular to the direction to the object. The heading is maintained by the autopilot or the pilot and the telescope mount control system can make up any differences up to a few degrees. The objects one wants to observe thus determine the direction in which the plane flies, and for how long. The trick is to use the plane's time in flight as efficiently as possible, since the operating costs of the plane are rather high (approximately \$10,000 per hour!). Two factors further complicate the planning of a flight. The first is the restriction that objects must be observed when they are within the limited elevation range of the telescope (35 to 75 degrees). The second is that the plane is constantly changing its geographic position and is affected by the wind speed and direction.

However, the fact that one's telescope is moving at more than 800 km/hr can be an advantage if flying west as the effective earth's rotation is reduced and the object can be observed for a much longer period than at a ground based telescope. Of course the disadvantage is that you end up on the other side of the world after having followed an object all night! Except for special excursions (mostly to Hawaii or the southern hemisphere) the plane is based at Moffett field. Consequently the flight plan must have the plane returning to San Francisco at the end of the run. Fortunately the NASA KAO staff have thoughtfully provided astronomers with a computer program which simplifies the task of flight planning. Taking the objects and the time needed to observe them, the computer generates a plan and then one must make compromises with objects and time to bring the aircraft back home in the maximum allowed flight time of seven and a half hours. There are many other differences between the KAO and a ground observatory. Perhaps the most obvious being the lack of right ascension and declination indicators. Once the telescope is pointed in approximately the right direction as determined by the navigation computer, acquiring the object is done by finding the proper star field in a finder telescope and then centering the object or guide star in the main telescope. Both the main telescope and the finder are equipped with television cameras so "observing" means looking at a television screen. Once an object is acquired, a tracking system overseen by a dedicated computer maintains the telescope pointing and only occasionally, when moderate turbulence is encountered, does the telescope lose tracking. There are two other computers on board, one to control the telescope and talk to the autopilot and other navigation systems, and the other to record and even analyze the data taken on the flight.

Before our flights, the first timers (myself and another member of our group) were taken on a guided tour of the aircraft to learn all the safety and emergency procedures. Then we were fitted with oxygen masks. In the event of depressurization at 12.5 kilometres we have 20 seconds to put on oxygen masks. The plane does sometimes fly higher (up to 13.7 km) but at that altitude one needs special training and certification in a high altitude pressure chamber, because if depressurization occurs at that altitude one has to don oxygen masks in less than 6 seconds! Adding even more to feeling that this is astronomy with the "Right Stuff" are the preflight briefings and systems check-outs. And of course the entire crew (except the astronomers) wear the NASA astronaut style flight suits. The crew generally consists of a minimum of four people, the tracker, computer and telescope operators and a mission director. This is in addition to the flight crew of pilot, copilot and engineer. The whole crew is very helpful and supportive of the astronomers, so that the flight will be successful. In the words of one mission director at the end of his preflight briefings, "Let's go get the data!"

This past summer our observing run on the Kuiper Airborne Observatory consisted of two nights separated by a day off to rest up. We arrived a week early to make sure that our equipment (which was shipped even earlier in a huge crate) was functioning properly and to set it up on the plane. Everything went very smoothly since three members of our group are veterans of over thirty flights each. Our instrument is a cooled (by liquid nitrogen and liquid helium) dual grating spectrometer which operates at wavelengths between 4 and 45 micrometres. It is used primarily to study emission lines of ionized elements in interstellar space. We observe mostly star formation regions (HII regions) and planetary nebulae. But this trip our target was the galactic centre. Specifically, we were looking for ionized silicon, which emits a spectral line at 34 micrometres. At optical wavelengths the galactic centre is obscured from view by the dense fog of interstellar material between it and us. However, at long wavelengths such as radio waves or the middle infrared range (such as we observe) can easily penetrate the fog and we can "see" into one of the most interesting regions of our galaxy. Interesting because it



The Kuiper Airborne Observatory (KAO) is a converted C-141 transport plane used for observing at an altitude of 12.5 kilometres. *Photo by Neil Rowlands.*

has been proposed that there is a supermassive black hole at the centre of the galaxy surrounded by infalling stars and clouds of gas and dust. Our study is a continuing one in that we want to map the emission the group detected on a previous flight. Thus we wanted to spend as much time as possible looking at the galactic centre on both of the flights.

As it turned out we were ready but the plane was not. Its high frequency radios, which are needed to fly over the ocean a 180 kilometres or more from land, would not work after the plane had been airborne for more than two hours. Unfortunately we could only observe the galactic centre by first flying south (it is a very southern object) and then west for the two hours we needed to do the mapping. This would mean flying halfway to Hawaii, so with the radios out we could not do it. The radios are not absolutely necessary but if anything happens in flight, it is good to be able to let somebody know where you are. Another ominous sign was the fact that the observing run four days earlier had been clouded out by a high haze at 15.2 km. This is rare but obviously it can happen. The first night came up without the radios being fixed so we went with our hastily arranged backup plan. We decided to continue with some earlier work in trying to detect various emission line of ionized elements (sulphur, silicon, neon and oxygen) in planetary nebulae and HII regions. This was actually fine by me because I am currently studying planetary nebulae. In fact I was very nervous, because I had to choose a couple of candidates in which we would be likely to detect the emission line in which we were interested.

The takeoff at twilight was very interesting as I sat in the cockpit and managed to get a good view of the Lick Observatory on a nearby mountain as we flew over it. Then it was to work, which was not too harried as everything worked well. I am told things can be very intense if the equipment does not work and aircraft time ends up being wasted! After flying back and forth the length of California for most of the night, with dips into Nevada and Arizona, we wrapped up a successful flight and then watched the sunrise from our hotel's outdoor jacuzzi. (Who says the life of a professional astronomer is all work?)

For the second flight we were given the ok to look at the galactic centre, and thus fly halfway to Hawaii, since they felt they had fixed the radios. We were halfway into the flight when we lost radio contact, but the pilots decided to continue anyway as our flight plan was known, whereas our route after turning around would not be. This was very fortunate for us as we obtained a lot of useful data. Too much in fact. We expected to finish the mapping job we started the previous summer, but the emission was more extended than we first thought. So it looks like we will have to return next summer to finish

the job. After spending two and a half hours looking at the galactic centre, we had to fly directly back to San Francisco by the quickest possible route as there are air regulations that limit the amount of time a flight crew can fly. Unfortunately we did not have much choice in terms of objects that would take us in that direction so we ended up just testing our instruments. We felt that the galactic centre data was important enough to justify dedicating a flight to it and we did not try to look at other possibly interesting objects. At the end of the flight we quickly removed our instruments from the telescope so the next group could mount their equipment and test it out. The next day we packed up and started analyzing the data.

All in all I would say it was a great experience, in many ways very different from ground based observing and in other ways quite similar. I was most impressed by the way the entire staff: telescope operators, computer programmers, flight crews, navigators and even the plane's maintenance crews are all there to make sure the astronomers return home with their data. After all, the KAO represents the astronomical community's only access to the middle and far infrared wavelengths, since the successful completion of the IRAS (Infrared Astronomical Satellite) project, a cooperative mission between the European Space Agency and NASA.

Following on the footsteps of the very successful programs KAO and IRAS, the next infrared project for NASA will be the Space Infrared Telescope Facility (SIRTF), a free-flying space telescope devoted to infrared astronomy, to be launched in the late 1990's. As part of the development for the spectrometer for SIRTF, the Cornell group will be testing a new infrared array. It will be used in a new grating spectrometer for the KAO. This will give us at least ten times the sensitivity of the old instrument. And this in turn will enable us to do middle infrared spectroscopy of extragalactic sources for the first time. So as exciting as these flights were, there are great prospects for the next ones.

Recent Publications from the AAVSO

New publications from the American Association of Variable Star Observers are listed below. For prices and information on ordering, please contact the AAVSO at 25 Birch Street, Cambridge, Massachusetts USA 02138, (617) 354-0484.

AAVSO Monographs, a new publication series, contain computer-generated long-term (20 years or more) optical light curves on one star per Monograph. The following Monographs are available: *Monograph 1* (SS Cygni Light Curves 1886-1985); *Monograph 2* (U Geminorum Light Curves 1855-1985); and *Monograph 3* (R Scuti Light Curves 1963-1985), just published. *Monograph 3* contains 17 pages of computer-generated optical light curves of over 30,000 observations of R Scuti, an RV Tauri-type variable.

AAVSO Bulletin 51 contains 1988 predicted dates of maxima and minima of 559 long period variables. It is used extensively by astronomers in scheduling observing runs.

Journal of the AAVSO, Volume 16 No. 1. Contains articles on variable stars ranging from "The T Tauri Stars" to "The Frequency of Outburst in SS Aurigae", book reviews, and summaries of AAVSO activities. Copies of Volume 15, No. 2, the 75th Anniversary issue, are still available. It contains historical and review papers and contributed papers presented at the three-day variable star symposium held in honour of the AAVSO's 75th anniversary in 1986.

General Catalogue of Variable Stars, 4th Edition, containing information on variable stars discovered and designated before 1982, is being distributed by the AAVSO. Volume I (covering the constellations Andromeda through Crux), Volume II (Cygnus through Orion), and Volume III (Pavo through Vulpecula) are now available. Volume III completes the basic information on all the variables in this Edition.

New Catalogue for Suspected Variable Stars, containing information on 14,000 stars suspected of variability, is also being distributed by the AAVSO.

Across the R.A.S.C.

CALGARY: As in previous years, the centre participated in a joint celebration of Astronomy Day, April 23, with the Calgary Centennial Planetarium. The theme this year was Light Pollution, which is becoming more and more noticeable as Calgary expands. Unlike other years, the evening outdoor session was held at Fish Creek Provincial Park, on the southern edge of the city. The traditional site for public star parties has been Glenmore Park, overlooking the reservoir of the same name, and well within the populated area. The Provincial Park authorities have offered the centre the use of their staff parking lot, with its car plug-ins, for setting up telescopes, as well as access to their outdoor theatre and washroom facilities. This spot has the added advantage of being on the other side of the buildings from the public parking lot, thus giving protection from car headlights, which can be a bit of a nuisance at Glenmore Park. Another Novice Astronomy class starts April 20 at the Planetarium, put on by Don Hladiuk and Bill Krosney of the Calgary centre. Numerous members plan to attend this year's Alberta Star Party, put on by the Edmonton Centre, in Dinosaur Provincial Park August 19-21.

VANCOUVER: The Annual Dinner this year was very successful with a good talk by Dr. Harvey Richter and excellent food. Plans for the Aldergrove Lake observatory site appear are progressing with the possibility of a pair of 21 m long trailers serving as bunk houses/darkrooms. A seminar on the use of the 14-inch Newtonian and the 10-inch f/14 Cassegrain telescopes was well-attended. Most interest was directed towards the Cassegrain as its long focal length makes it a more viable choice (although a more massive one!) for use during the upcoming Mars observing season. The Centre is also gearing up for the General Assembly in Victoria and helping to organize the Mount Kobau Star Party. Various courses held at the Gordon Southam Observatory are proving to be very popular. Lance Olkovich, our prolific telescope maker, has created some programs for calculators to use with setting circles on Dobsonian telescopes with an accuracy of one tenth of a degree.

KITCHENER-WATERLOO: At the Centre's February meeting, Mike Gore gave a talk on the CCD (charged coupled device) he is building. After explaining the operation of a CCD, Mike described the various technical difficulties involved in constructing a device of this kind. A group of observers gathered at the observatory in late February to view the Pleiades occultations. Unfortunately, cloud cover meant that only one event was observed. The Centre has decided to hold a series of star nights for its members. Observers will gather at the Ayr observatory the Sunday before, and the Saturday after New Moon.

SARNIA: New Centre Secretary Reg McMichael reports the club has a new meeting room. The new site is the municipal offices of the town of Clearwater, 2109 London Road. Meetings are held on the last Friday of every month at 7:30pm and observing sessions follow the meetings if the sky is clear. Reg McMichael's address is: R.R. 2, Camlachie, Old Lakeshore Road, Camlachie, Ontario N0N 1E0.

WINDSOR: Randy Groundwater is doing a six-part series on the planet Mars for the centre's newsletter *Aurora* in recognition of the upcoming Mars opposition. During the spring the Detroit Astronomical Society and the Windsor Centre did a speaker exchange with Randy being the Windsor representative. The Education committee has been active with talks to three Brownie Packs and one Beaver Troop in March, a booth at the spring Science Fair in Windsor and plans for a school program in late May.

MONTREAL: Stew Marshall reports in *Skyward* that repairs have been completed to the centre's observatory. As the building sits on a slope near Molson Stadium the pier has been gradually tilting downhill. But in thirty-three years this tilt has amounted to less than one degree. However, by last autumn the pier had come to rest against the observatory floor and vibrations could be transmitted to the telescope. Last autumn's repairs should make the observatory vibration-free until the end of the century.

LONDON: The Centre is planning to send a group to the 1989 Texas Star Party with Dan Tremblay and Joseph O'Neill in charge. Plans are going ahead for the use of the new observing site to the northeast of

London and the April *Astronomy London* featured a list of rules for using the new site. Jim Lucyk wrote an article on the Uranometria 2000.0 in the same issue and included two pages of labelling errors in the first edition of the atlas.

VICTORIA: New *Skynews Victoria* newsletter editors Alice Newton and Doug Welch have changed the design of the newsletter and increased its size to about 20 letter sized pages. Through a personal appeal by Doug Welch for books for the Centre library, a total of 26 new books were donated. Malcolm Scrimger is the new Centre Recorder.

NIAGARA: A new feature of centre meetings is the use of name tags so that names can be associated with faces. By unanimous consent of the membership at a meeting, the new Centre's observing site at Rockway is the choice for a new observatory. To help raise money for the observatory about 3000 tickets have been sold for a raffle. The club is also making astronomy highly visible by the addition of custom-made astronomy caps to the jackets already being purchased by members. A special issue of *Niagara Whirlpool* is planned this summer to celebrate 30 years of astronomy in the Niagara Region.

EDMONTON: Bruce McCurdy reports in *Stardust* that the centre has added 40 new members so far this year. President Peter Ceravolo organized centre participation in a special festival on March 5th when a large piece of land containing the centre's planned permanent observing site was transferred from one provincial ministry's responsibility to another ministry. About 2500 people came to the festival.

OTTAWA: Two rounds of Messier Marathon observing were planned for March and April at the Indian River Observatory. There are two classes of observatory keyholders. Basic keyholders pay \$15 per year and get access to the clubhouse only. Full keyholders pay \$30 for full access to the clubhouse and the 16- and 10-inch telescopes.

KINGSTON: The centre was able to get Tom Dey of the Rochester Astronomical Society as guest speaker for its April meeting. Tom Dey is an outstanding astrophotographer, a lighting engineer at Eastman Kodak, and an authority on the topic of light pollution.

SASKATOON: Richard Huziak reports work is progressing on the 16-inch telescope being built by members of the Centre. Estimated cost of the completed research quality facility will be about \$10,000.

TORONTO: Paul Markov has completed the fourth edition of the centre's Directory of Observers. Containing information on 495 members, or about 40% of the total membership, the directory gives coded information describing each observer's equipment, observing experience and interests, and using postal codes allows members to identify other members in their area. The centre's 22-member expedition to the Philippines to see the March total solar eclipse successfully returned with the promise that a special meeting in May devoted to the eclipse would be spectacular. In April, the centre put on a special exhibition at the Royal Ontario Museum on a day dedicated to promoting clubs who use the ROM's facilities.

Across the R.A.S.C. is a regular feature of the *Newsletter*. Centre editors or secretaries should send reports of their centre's activities directly to the Editor. Deadline for the October issue is August 1.

Request For Photos

Calling all photographers! The *National Newsletter* needs photos to make the front cover more attractive and to provide interest and variety in the material enclosed in each 16 page issue.

Members are invited to submit photos to the *Newsletter*. They can be photographs of astronomical objects, observatories, interesting telescopes, club activities, etc. but should have a little bit of a story to them. Colour slides can be used but black and white prints are preferred.

Events Calendar

- June 25–July 3 *Joint Meeting of the Royal Astronomical Society of Canada, the Astronomical Society of the Pacific and the Western Amateur Astronomers*, University of Victoria, Victoria, British Columbia.
- June 29–July 4 *International Planetarium Society Conference*
Richmond, Virginia
- July 15 *18th Annual Syracuse Summer Seminar*
Syracuse, New York. Contact: Frank Rioux,
1115 East Colvin Street, Syracuse, New York,
13210. Phone (315) 455-1003.
- August 5–6 *Statfest '88*
Mount Forest, Ontario. Contact: Andreas Gada, 16 Beaufield Avenue,
Toronto, Ontario M4G 3R3.
- August 11–15 *5th Annual Mount Kobau Star Party*
Mount Kobau, British Columbia. Contact: Peter Kuzel, 4100 25th Avenue, Vernon,
British Columbia V1T 1P4. Phone: (604) 545-1226.
- August 12–15 *Nova East '88*
Fundy National Park, New Brunswick. Contact: Halifax Centre RASC,
1747 Summer Street, Halifax, Nova Scotia B3H 3A6.
- August 13–16 *IAU Colloquium No. 112 "Light Pollution, Radio Interference, and
Space Debris"*, Washington, D.C.. Contact: Dr. David Crawford,
Kitt Peak National Observatory, Tucson, Arizona, 85726.
- August 17 *Stellafane*
Springfield, Vermont. Contact: Dennis di Cicco, 60 Victoria Road, Sudbury,
Massachusetts 01776.
- August 19–21 *Alberta Star Party*
Dinosaur Provincial Park. Edmonton Centre RASC. Contact: George Moores,
2415-107th Street, Edmonton, Alberta T6J 5N4.

Starfest '88

August 5–6, 1988

The North York Astronomical Association, in cooperation with the River Place, invites all astronomers to attend its seventh annual observing convention/camping weekend. The convention includes observing sessions, slide presentations, workshops, commercial displays and a "Twilight Talk." Observers are invited to bring their telescopes and share their observing experiences. The convention will be held at the River Place Campground located eight miles north of Mount Forest, Ontario. To obtain more information, please write to: STARFEST '88, c/o Andreas Gada, 16 Beaufield Avenue, Toronto, Ontario M4G 3R3.

Letters to the Editor

Attention Telescope Makers

A request goes out to telescope makers across the RASC for information and assistance. I am considering construction of a two mirror unobstructed reflector, specifically the design of Anton Kutter's two mirror schiefspiegler (*Sky & Telescope*, October 1961; *Telescope Making* magazine issues #1 and #4). A *Sky & Telescope* Gleanings bulletin, Gleanings Bulletin A, detailed the theory behind Kutter's design. Can anyone assist me in obtaining a copy of this now out of print bulletin? I would also be interested in corresponding with fellow amateurs who have had experience with either two or three mirror schiefspiegler telescopes.

Bill Krosney
42 Sunhaven Place SE
Calgary, Alberta T2X 2X6

Evaluation of *Uranometria 2000.0*

With regard to Paul Comison's evaluation of *Uranometria 2000.0* (February issue, page 16), it is exactly because of its large loose sheet size that I prefer Tirion's *Sky Atlas* over *Uranometria*. Only the required sheets that are needed for a particular night's observing need to be handled, unlike the entire book that is *Uranometria*.

But Comison's solution: photocopy all 259 sheets! At 25 cents a crack at the local library's photocopier that would amount to a small fortune. After spending \$60 for the atlas, I have to spend more to make it practical for field use? Forget it!

Gordon Friedrich
18 Brussels Court
Woodbridge, Ontario L4L 3E2

Arabian, not Persian Gulf

Thank you for releasing the photo and article of our Observatory (December issue, page 92). We look forward to receiving the responses from your readers who may wish to contact us for an exchange of information.

However, you mentioned the our Observatory is known throughout the Persian Gulf States. This area is now known as the Arabian Gulf and the wording "Persian" is no longer used. We were planning to circulate your newsletter to our friends but for this reason are unable to do so.

Abdul Ilah Marafie
Wafra Observatory
PO Box 122 Safat
Zip Code 13002
Kuwait

(*Editor:* Unfortunately, old designations in common usage are sometimes difficult to change. Even one of Canada's most well-known national television news broadcasters, Knowlton Nash, recently used the old designation to describe the situation in the Gulf. The correct designation has been noted.)

Observer's Cage

by David H. Levy
That Other Amateur Group

This summer we get the chance to hold a joint meeting with two other societies, the Astronomical Society of the Pacific (ASP), and the Western Amateur Astronomers (WAA). Most of us know of the ASP as a good professional organization which is meeting this year for the 100th time. For much of this century the ASP has emphasized areas in which amateurs and professionals have worked together. Meeting with the ASP should enrich our 1988 General Assembly.

What about the WAA? Based largely in California but including other western states, the Western Amateur Astronomers is a very interesting grouping of astronomy clubs whose main purpose is to get together once a year for a convention. Sometimes they meet with the other large amateur federation in the United States, the Astronomical League, and at other times they meet alone.

The WAA has an interesting series of awards designed to promote enthusiasm in specific areas of astronomical endeavour. Their G. Bruce Blair Award, named in memory of the group's founder, honours an amateur astronomer who has achieved great distinction in some combination of observing and service. They also have the E.E. Barnard award for excellence in observing, the Caroline Herschel astronomy project award, and a service award.

This year's Blair award winner, Steve Edberg, is truly a WAA bright star. During his recent presidency he did much to increase the WAA's stature by instituting a more active program that emphasized amateur cooperation with professional astronomy. You will also meet Cliff Holmes in Victoria. As one of the most active amateurs in the world, this past Blair winner has guided the Riverside Telescope Makers Conference throughout its 20 year history, has run many WAA conventions, and currently spends much of his time giving young people guidance in astronomy.

Of all the regional amateur societies in the United States, the Western Amateur Astronomers most closely shares the social spirit that the RASC offers at its general assemblies. This may seem strange. While the RASC is a highly organized society with a strong central office, the WAA is loosely run (the only other annual gathering is a midwinter board meeting held in California). I guess this shows that how an organization is run may be less significant than the kind of person attracted to that organization.

GA '88 will give us a chance to meet amateur and professional astronomers we have not met before. Don't miss this special opportunity to making some international friendships!

Report of the January 1988 National Council Meeting

by Leo Enright
National Recorder

The National Council of our Society held a meeting on Saturday, January 30, 1988 in the Library of the National Office in Toronto. The National President, Mrs. Mary Grey, presided and a total of fourteen of the twenty centres of the Society were represented. The agenda included reports from the officers and standing committees of the Society, and several important decisions were adopted.

Council approved the concept, suggested by members of the Calgary Centre, of producing a national poster such as could be used for advertising centre Astronomy Day activities, and a committee was formed to carry out the production of the poster. The RASC Seal Committee which had been formed to investigate the use of the Society's seal was empowered to seek legal advice from the Society's solicitor regarding the use of the seal. It is to report again at the next meeting of council in Victoria. The Centennial Committee, composed of Dr. Bishop, Dr. Percy, and Mr. Broughton, is to receive ideas and suggestions for marking the Society's centennial year in 1990.

The Treasurer, Dr. Ralph Chou, presented the 1987 Unaudited Financial Statement and the operating budget for 1988. Both were approved by council. The National Librarian, Mr. Brian Beattie, presented plans for increased numbers of new library acquisitions for the coming year and for selecting a new binder to bind periodicals at a considerable savings to the Society. Journal editor, Dr. Alan Batten, announced that the Editor Selection Committee was recommending Dr. Jeremy Tatum as the new Journal editor, beginning with the 1989 volume. Council wholeheartedly approved the nomination.

On recommendation from the Awards Committee, decisions were made concerning this year's presentations of the Society's major awards. The Service Award is to be presented to four very worthy recipients: Dr. Batten, Dr. Bishop, Dr. Locke, and Mr. Orr. The Chilton Prize will be received by Mr. Philip Teece of the Victoria Centre, and the Chant Medal will be awarded to Mr. Chris Spratt, also of the Victoria Centre. The Awards Committee also approved the awarding of four Messier Certificates to members of the Kingston, Edmonton, and Windsor Centres. The Honorary Members Committee recommended Mr. Grote Reber as the newest Honorary Member of the Society, and Council endorsed the recommendation.

Regarding the National Newsletter there was discussion about, and a proposal for a new bilingual cover for the publication. The Constitution Committee reported working on the third draft of the proposed new constitution for the Society.

There was considerable discussion regarding the approaching centennial of the Society (in 1990) and suggestions were advanced for ways to mark the occasion. Council established a Centennial Fund and approved a motion to institute a fundraising campaign for major new initiatives of the Society. As a first step towards one potential centennial project, a committee was appointed to investigate the idea of publishing a mini-Handbook of basic astronomical data.

A model of the new Plaskett Medal, which has replaced the Society's Gold Medal, was seen for the first time by members of Council.

The Astronomy Day Coordinator, Leo Enright, presented suggestions concerning this year's International Astronomy Day which will be held on Saturday, April 23. A report was received concerning plans made so far by the Victoria Centre for this year's General Assembly scheduled for the Canada Day weekend. There were indications that at least two centres of the Society would be applying to host the 1990 General Assembly.

Council gave approval to a plan for assisting (with \$500) the International Astronomical Union's Colloquium 105 which is devoted to astronomical education. The colloquium will meet this summer in the United States and the money will assist astronomy educators who otherwise might not have the chance to attend. Council also approved a grant of \$350. to the Centre de Quebec for the publication of its annual *Almanach Graphique*.

Complete details regarding all the items discussed at this meeting may be found in the minutes of the meeting which have been distributed to all centre presidents and National Council Representatives.

Nouvelles de la S.A.M.

par Marc Gelinas
Société d'Astronomie de Montréal

Chaque semaine la SAM offre à ses membres et au public une causerie sur l'astronomie. Le premier mardi du mois on invite un conférencier professionnel à venir rencontrer le public. En général il s'agit d'un des astronomes de l'Université de Montréal. Ainsi au cours de l'hiver 87-88 deux conférences ont attiré l'attention de façon particulière.

Le Dr. René Racine, directeur de l'observatoire du Mont-Mégantic et ex-directeur du Canada-France-Hawaï, est venu nous parler du projet d'un télescope canadien de nouvelle technologie (TCNT). Selon le Dr. Racine il y a moyen d'améliorer le rendement d'un télescope moyen (ex. deux mètres) en utilisant des techniques modernes. Les télescopes tenestres qu'ils soient de 15 cm ou de 15 m se butent à l'atmosphère qui empêche une résolution moyenne meilleure qu'une seconde d'arc. Or, selon le Dr. Racine il y a moyen de construire un télescope de façon à limiter les sources de turbulence atmosphérique à son voisinage. Le résultat serait que ce télescope pourrait résoudre des images de 0.5" ou mieux. Un budget de l'ordre de 20 millions de dollars rendrait possible la construction d'un TCNT de deux mètres qui serait aussi résolvant que le quatre mètres du CFH.

Actuellement le Dr. Racine travaille sur deux plans. La niveau technique, conception et mise sur plan et le niveau politique, trouver des fonds. Pensons-y, pour environ le prix d'un seul avion F-18 le Canada pourrait avoir un observatoire astronomique parmi les plus efficaces du monde; allez donc faire comprendre cela à un politicien.

Une autre conférence qui a eu un grand succès fût celle du Dr. Gilles Fontaine. Celui-ci a fait parler de lui l'été dernier quand l'équipe avec laquelle il travaille a conclu que l'âge de l'univers doit

être de 10 ± 2 milliards d'années. Jusqu'alors, dans le monde de l'astrophysique les estimations de l'âge de l'univers étaient de 7 à 23 milliards d'années. Bien sûr tout le monde n'est pas encore convaincu. Le Dr. Fontaine nous a expliqué pourquoi il défend un âge de l'univers autour de 10 milliards d'années. En étudiant les naines blanches depuis 15 ans, lui et ses collègues, ont conclu qu'il n'y a pas de naines blanches plus vieilles que 10 milliards d'années. Leur conclusion est claire, s'il y avait des naines blanches plus âgées, ils en auraient observées à coup sûr durant leur recherche car ils avaient tous les outils requis pour cela. Ce n'est pas la place ici pour expliquer comment ils en arrivent à cette affirmation, mais le lecteur est encouragé à assister à l'une des conférences que donne le Dr. Fontaine sur ce sujet pour s'en convaincre à son tour.

Une objection de taille est que d'autres astrophysiciens ont estimé l'âge d'amas globulaires à 14 milliards d'années et plus. Le Dr. Fontaine impute cette différence à la théorie de l'évolution des géantes rouges sur laquelle est basée mesure, mais qui est moins au point que celle des naines blanches. Quant à la détermination de la constante de Hubble basée les red-shifts de quasars elle est on peut plus sujette à caution. La théorie de l'univers inflationniste serait une solution pour rendre compatible les mesures du red-shift et un âge de 10 milliards d'années.

Vous voyez quelle est le genre de conférence qui se donne le premier mardi du mois. Si par hasard vous n'y êtes jamais venu venez donc un de ces mardis. Nous nous réunissons à 20h au Centre St-Mathieu, 7110 8^e Avenue, Montréal (entre les rues Jean-Talon et Bélanger un peu à l'ouest du Blvd St-Michel) et c'est gratuit bien sûr.

Astronomy Day Calgary 1988

by Glenn Hawley
Calgary Centre

Over 900 members of the public attended this year's Astronomy Day events, held Saturday, April 23. From 13:00–17:00 we had our displays set up at the Alberta Science Centre (the Calgary Centennial Planetarium). The themes of this year's session were "Introducing Children to Astronomy", and "Light Pollution".

As many as possible of the exhibits were aimed at exciting the interest and enthusiasm of the youngsters. Some of the items were a little low to the ground as a result, though. The music of the rock band U2 was featured, perhaps (hopefully) reducing somewhat the aura of "stuffy old adulthood" that is sometimes perceived as being associated with astronomy. A TV screen is always a good attraction, so one of our members made a video featuring some of his best astrophotos set to music (not U2). This proved even more interesting for some of the youngsters than were the prints, despite the loss of resolution in going to the screen.

As for light pollution, the city of Calgary currently puts in the dreaded HPS (high pressure sodium) streetlights for all new installations. These are notorious for emitting over a wide range of the visible spectrum, making their light extremely difficult (or practically impossible) to filter out effectively. The city has, to date, not shown itself to be very enthused about the idea of changing over to the less odious low pressure sodium lamps, and we must increase public awareness of the problem if we are to have any hope of being able to influence policy on this issue. Unfortunately, we compete for politicians' attention with numerous other current controversies (dam construction, land-use policy, abortion funding, French linguistic privileges, welfare and housing policy, etc.) all of which have much higher public profiles. It promises to be a long, uphill, and possibly doomed struggle, but we feel we have to keep trying, if only for the sake of our peace of mind.

The weather cooperated reasonably well, despite gloomy predictions from the weather bureau. Some scattered clouds interfered from time to time during the afternoon, but the ominous masses threatening from the west stayed over against the mountains. The Sun, Venus, and the Moon provided our celestial entertainment for the afternoon, from the esplanade of the planetarium. Indoors were the Star Chamber show, films and slides in the Pleiades Theatre, lectures on telescope making, equipment displays, and our light pollution presentation. This last featured astrophotos taken from within the city, and from somewhat darker skies outside of town, to demonstrate just how dramatic the sky washout and the loss of contrast can be.

A barbecue at the Hull's Wood picnic area in Fish Creek Provincial Park for the volunteers and staff

followed at 18:00. A few of us arrived early to reserve sites for those who were still packing away the exhibits at the Science Centre. Around 20:00 we started to set up our scopes for the public observing session in the staff parking lot of the nearby Bow Valley Ranch visitors centre. The facilities are just about perfect for this type of event. We had rows of car plug-ins for our clock drives, the valley wall sheltered us from the worst of the city's lights to the north, and we were protected from car headlight glare by the buildings of the visitors centre.

A good variety of telescopes was available, from refractors made by adapting camera lenses, to binoculars, Maksutovs and Schmidt-Cassegrains, Newtonians and Dobsonians, some store bought, some homebuilt to various degrees, from 5cm to 50cm diameter; about 40 instruments all told. At least 500 people came out for the evening session, many of whom had been to the Planetarium earlier in the day.

The temperature fell a few degrees below zero as the evening advanced, and many of the public were quite happy to come into the warmth of the indoors to see the slides, displays, and video shows that we had brought down from the afternoon showing at the Planetarium, and to hear a brief talk on what they might expect to be able to see through the telescopes outside. Most of the members, of course, came better prepared for the cold; telescope work not being known for its aerobic activity levels. Though the clouds and high altitude haziness were an ever-present menace, and the Moon was fairly bright, some of us did manage to see comet Liller through the city glow. Galaxies, clusters and nebulae (especially through the larger scopes), Venus, the Moon, our favourite double stars, and even the constellations were all subjected to the public eye, accompanied by whatever information each of us centre members felt knowledgeable enough to give.

By midnight the crowds had disappeared, the staff were getting ready to close the park, and the haze and clouds had begun to thicken noticeably. All clear omens that it was time to pack it in and head for home.

The Calgary centre's thanks goes out to all who volunteered their time and effort to make Astronomy Day a success, particularly to those who created and organized the displays and presentations, and to those who offered up their time and their instruments, large or small, to the mercy of the interested public.

Other Worlds

by Len Larkin

Saint John Astronomical Society

To the delight of astronomy and art enthusiasts, the New Brunswick Museum in Saint John, New Brunswick hosted a display titled "Other Worlds" in one of its galleries this past February and March. The exhibit highlighted works by members of the International Association of Astronomical Artists.

The exhibit got off to an excellent start as well-known astronomy writer and enthusiast Terence Dickinson opened the display with a lecture. Most readers of the *Newsletter* will not be surprised to learn that Mr. Dickinson works closely with astronomical artists since his books are filled with spectacular illustrations.

He presented his talk "The History of Astronomical Art" to the more than 50 people present and showed its evolution from 19th century illustrations through to current works. Here were many interesting slides shown in conjunction with his talk and I was fascinated by one in which the artist gave a panoramic view of the rings of Saturn, viewing them nearly edge-on towards the mother planet! Following the lecture Mr. Dickinson chatted with his audience, including some of us from the Saint John Astronomical Society.

After the presentation it was time to hunt down the "Big Game" awaiting in the gallery and we strolled through the over 40 works on display. If I could describe these paintings perfectly there would be no need to paint them. But many warrant special mention because of their uniqueness.

The solar system was strongly represented but each painting highlighted a special viewpoint. "Neptune From Triton" by J. Hagen very much gave the planet a three dimensional aspect with its dark side obliterating many of the tiny starpoints. Another painting by Hagen, "M-82", was reminiscent of the stylized silky drawings by the 19th century observer, E.L. Trouvelot, and seemed to tame the violent aspect of that galaxy. Another artist took us back to the outer reaches of the solar system to watch a Cassini spaceprobe splashdown into a sea of liquid methane on the moon Titan. The

tongue-in-cheek title was “At The Beach”! We were then brought much closer to home with the heroic “Morning Launch” which showed the space shuttle thundering up through the cloud deck. I found it hard not to hear the thunder and feel the victory of a successful launch.

Jupiter was the subject of over half a dozen works and each captured the planet in a different way. Discussion developed around the proper appearance of the day-night terminator, cloud details, and exactly how sharp the planet’s edge should appear. Most of the views were from the exotic surface of Io which gave Jupiter a suitably overpowering effect. But the most spectacular Jupiter vista was by A. Gutierrez whose large, panoramic work placed the viewer amidst the upper cloud deck. Imagine watching a Galileo probe glide into a gap in the multi-coloured, layered clouds as a low sun backlights the clouds causing them to glow and shimmer as they trail off to the distant horizon.

“Zodiacal Light” by Don Davis was rather special for me as I had first seen the phenomena just last year and this subtle rendering captured the moment nicely. The painting should especially interest amateurs as the starfield was depicted accurately and the observing data was listed unobtrusively in a corner. “Shuttle” by Michael Carroll placed the viewer in near-Earth orbit to watch the space shuttle eclipse the sun. The tiny background starpoints lure the viewer to within 50cm of this large work and, at this close range, the scene was overwhelming! Some artists took us to interesting moments in time with their canvases. One such work, “Earth In The Far Future” by Joe Tucciarone, showed the planet surrounded by a ring of debris which had been our moon.

In conjunction with “Other Worlds”, two other programs were held. On one Sunday, Dr. Stanton Friedman presented a talk concerning UFO’s and two days later the Saint John Astronomical Society made a presentation. Rick Hancox, Dave Driscoll and I gave indoor talks speaking on the night sky, stellar evolution, and highlights of the Sagittarius region.

This beautiful exhibit will capture the imagination of not only astronomy enthusiasts but also the general public. I suggest that you contact your local museum to express interest in this display. The sponsoring organization is: Association of Science-Technology Centers, Travelling Exhibition Service, 1413 K Street, NW., 10th Floor, Washington D.C. 20005-3405, or phone (202) 371-1171. Arthur C. Clark said it best: “The astronomical artist will always be far ahead of the explorer. He can depict scenes which no human eye will ever witness, because of their remoteness in time and space”.

Comet Bradfield: A Look Back

**by Patrick Kelly
Halifax Centre**

Comet Bradfield shall not be soon forgotten by many of us. It put on a show which in some ways was better than that of Comet Halley. It was not much brighter, but it was high in the sky and easy to find. You will no doubt recall its passage by the globular star cluster M10 in Ophiuchus last fall. That was when I first spotted it. I was using 20 x 80 binoculars and was going to hop from another globular M12 to M10 and then to the comet. I actually found the comet while looking for M10! I noted that it appeared about the same size as the famous globular M13 but was more centrally condensed. By comparison with M10, M12, and M13, I estimated the magnitude of Comet Bradfield to be 6.2.

Another Halifax Centre member, Michael Boschat, sent in two reports on Bradfield in October. On the 9th he reported its appearance through his 80mm refractor as similar to that of a small globular cluster at magnitude 6.4 and 8” in diameter. He also suspected faint jets when observing at 90x. On the 13th, he observed an 8.5 magnitude point-like nucleus and a short fan shape at a position angle of 80 degrees which could have been either the coma or the beginnings of a tail.

Perhaps most significant to me was that Comet Bradfield was the first object for which I had actually made a sketch. A sketch made by Doug Pitcairn in December using a 10-inch f/4.5 telescope and by myself in January using an identical instrument showed obvious changes in the comet.

I observed Bradfield often during the time it was visible. My wife and children also got a good view of it (their second comet). In addition it was nice to compare Bradfield with another comet, Borrelly, when they were both visible at the same time.

Although Bradfield has now departed and Comet Liller appears to be ready to take its place as “the” comet, I shall always remember Bradfield and the many times its sight filled me with wonder.

Reprinted from Halifax Centre’s *Nova Notes*

Alberta Star Party '88

- When: August 19-21, 1988
- Where: Dinosaur Provincial Park, Brooks, Alberta
(about a two hour drive east of Calgary, Alberta)
- Cost: \$20.00 for registration and first family member
\$5.00 for each additional family member
- Includes: Registration Fees, talk by guest speaker from Tyrrell Museum on
"The Death of the Dinosaurs", guided tours of the dinosaur bone beds,
a Bar B-Q Steak Dinner, and much, much more.
- Host: Edmonton Centre RASC

This is the Star Party with the extra of *Dinosaurs*. We are camping beside one of the most exciting "Dinosaur Digs" in North America!. This may well be one of "the" Star Parties of the summer to attend.

Camping sites are limited so we suggest to all those planning to attend – please reply early to avoid disappointment. Contact: George Moores, 2415-107 Street, Edmonton, Alberta T6J 5N4. Phone (403) 436-2855 (evenings).

Fred Lossing Receives Recognition

Well-known member of the Society and Ottawa Centre member Dr. Fred Lossing has been awarded the title of Researcher Emeritus by the National Research Council of Canada. Presented in recognition of outstanding and continuing contributions to research, the title, awarded for life, is given to an individual who has retired from the council but who continues to be active in research-related activities as a guest worker or under some other arrangement.

Dr. Lossing, a chemist specializing in mass spectrometry, has published nearly 200 papers on subjects relating to bond strengths, heats of formation of free radicals and thermochemical data. He retired from the council in 1980.

Congratulations, Fred, on your achievement!

First Soviet Spacecraft Models

The McLaughlin Planetarium in Toronto recently purchased three Soviet-made spacecraft models, destined for public display in the Planetarium. These are the first and only such models to arrive in North America.

In July 1988, the Soviet Union will launch the Fobos mission, two robot spacecraft sent on a journey to the planet Mars. In an unusual move, the Soviets announced this mission to the world a full ten months in advance. The Soviets have even constructed detailed scale models of Fobos and other spacecraft with the intention of selling these models to Western markets.

Dr. Tom Clarke, Head of the McLaughlin Planetarium, heard about the models in September 1987 at the Ninth International Planetarium Directors Congress held in Moscow. On the last day of the Congress, Sergie V. Kovalevsky, Director of Experimental Factory "Znanie", was the speaker.

"Suddenly Director Kovalevsky was saying that these models could be purchased, and handing out a list of what was available," said Dr. Clarke. "Since the list was in English, he was obviously interested in sales to the West, and what caught my eye was Fobos."

Detailed information and photos about Soviet space missions are usually hard to come by. Dr. Clarke

was interested in the Fobos model for use in the McLaughlin Planetarium's summer star show *Mars: The Journey Begins*. As soon as he returned to Toronto, he wrote to Vneshtekhnika, the Moscow factory that manufactures the models requesting quotes for three 1/10 scale models: Fobos, the prototype of a new series of Soviet interplanetary spacecraft; Salyut, the Soviet orbiting space station; and Vostok, the original manned capsule.

After a three-month silence, a Telex arrived promising delivery by March 1988. Dr. Clarke telexed his acceptance of the terms and soon a second Telex arrived.

"We were told that our order was accepted as per their standard delivery contract," said Dr. Clarke, "but we never did see that standard contract. We were to remit the money in advance by cabling it to their bank. And what, they asked, is a purchase order?"

Once the flurry of telexes ended, the McLaughlin Planetarium was the proud owner of three Vneshtekhnika models. Dr. Clarke describes the workmanship on the models as "exquisite." Fobos will be installed for public display in mid-May and the other models will be displayed at a later date.

News Release from the Royal Ontario Museum

Minor Planet Toro Approaching Earth

by Chris Spratt
Victoria Centre

On August 4, 1988, the Apollo-type minor planet Toro (1685) will pass within 0.183 astronomical units of the Earth. For a few days, before and after this date, the minor planet will be favourably placed for visual observation as it moves rapidly northward.

The accompanying table is the computed ephemeris (equinox 1950.0) calculated by the writer. It should assist those interested in viewing this object.

Date (1988)	R.A. h m	Declination	Distance (A.U.)	Magnitude (Visual)
July 22	23 07 51.8	+24 54.28	0.220	11.9
23	23 12 59.6	+26 47.38	0.215	11.9
24	23 18 29.8	+28 44.49	0.211	11.8
25	23 24 24.4	+30 45.41	0.206	11.8
26	23 30 46.4	+32 49.54	0.202	11.7
27	23 37 39.2	+34 57.04	0.198	11.7
28	23 45 06.5	+37 06.41	0.195	11.7
29	23 53 12.4	+39 18.04	0.192	11.7
30	00 02 01.8	+41 30.27	0.189	11.6
31	00 11 39.6	+43 42.53	0.187	11.6
Aug 01	00 22 11.4	+45 54.19	0.185	11.6
02	00 33 43.1	+48 03.31	0.184	11.6
03	00 46 20.5	+50 09.09	0.183	11.6
04	01 00 09.3	+52 09.46	0.183	11.6
05	01 15 14.4	+54 03.50	0.183	11.6
06	01 31 39.0	+55 49.45	0.183	11.7
07	01 49 23.9	+57 26.00	0.184	11.7
08	02 08 26.6	+58 51.05	0.185	11.7
09	02 28 39.8	+60 03.42	0.187	11.8
10	02 49 51.5	+61 02.52	0.189	11.8
11	03 11 44.7	+61 47.55	0.191	11.9