Royal Astronomical Society of Canada

BULLETIN

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Reflections

N.A.S.A., POOR N.A.S.A.
by Doug Pitcairn
Halifax Centre

Two decades ago, the question would have been unthinkable. Now it is repeated so as to be worn out. What is wrong at N.A.S.A.? I mean, it would be O.K. for any normal group of human beings to have three major projects out of four develop problems. But these guys are not normal human beings, at least not in the common perception, and certainly not from our Canadian viewpoint. Many of us see N.A.S.A. as something pretty special, not just for our southern neighbours, but for the entire race. Part of this perception is an assumed infallibility. Surprised? You shouldn't be.

In the last years of the fifties and the early sixties, it was quite obvious that the American space program was all too fallible. It seemed that every second launch attempt ended in some sort of catastrophic failure. But then came the heady rush to the Moon. I will never forget those crude black & white images on the small television screen of Cy Kennedy's cottage up at Brule. I dare say that millions of other people also fondly remember where they were during that amazing summer back in 1969. I have never before or since experienced that feeling of being on the edge of something great. How proud I felt at the time that the United States, (which is after all, almost Canada, or at least so it seemed to a twelve year old boy) could show the rest of the world the way to the stars. Who could have doubted that mankind was finally embarking on the final exploration? Let's face it, the entire Gemini/Apollo program left the planet somewhat in awe of U.S. technology, and a perception that America's National Aeronautics and Space Administration was something close to a divine organization which could do no wrong.

It was certainly a reasonable perception. The Apollo program ripped through a whole field of new technology at a pace that makes today's seem like a snail's crawl. Astronauts rode into space atop thousands of pounds of practically untried technology. One could argue that every Apollo flight included many prototypes, and was in effect, each and every one a test flight. To achieve the level of success N.A.S.A. did under these circumstances is quite unique in the history of mankind's technological development. One cannot help but conclude that in addition to the people involved believing with a passion in the importance of their work, they also must have had a good case of "random odds operating in their favour", to quote Mr. Spock of *Star Trek* fame.

Then came the seventies. If there is one lesson to emerge from the space program of that turbulent decade, it was the dependence of success on funding. I suppose what had been obvious during the previous decade to those on the inside was finally brought home to the public. Success in space would come at great cost. Program after program was slashed or reduced as internal politics and world conditions dictated funding restraints. What emerged from these years was a leaner N.A.S.A. quite intent on pursuing its goals within the scope of its funding.

But high technology is expensive stuff, and quite unforgiving of cost cutting. Eventually shoestring budgets and a top-heavy bureaucracy took their toll, as is now too obvious in N.A.S.A.'s case. The troubles of the eighties are now history. Yet the lesson is clear, victories over the void "out there" will require considerable financial (and hence political) resources.

I, for one, am still very confident in the eventual conquering of space. Keep in mind that the largest N.A.S.A. budget ever, at the height of the Apollo program, was still but a few percent of the U.S. military budget. I hope that in the decades to follow, we can get past the point we are now at. The industries which develop new ways of killing people for the military are quite capable of developing space technology. What we need is an international space agency which is above and free of the scourge of nationalism. Can you imagine what would be possible if significant fractions of the world's military budgets were devoted to space exploration? If we could only get past this habit of holding guns to each other's heads long enough to get on with the exploration of the galaxy. Wake up human kind, we have light-years to cross, star systems to explore and worlds to conquer! ✪

My Second Editorial

I hadn't planned on writing again so soon, but a few things have come up. Firstly, I was able to adopt a suggestion made by several people to increase the inside margin of the new format. As a result, you can easily use a three-ring binder to keep, not only the *Bulletin*, but the new-format *Annual Report* as well.

The new format for the *Annual Report* has been developed and it marks a significant change from the previous one. I hope to make even further changes in next year's edition, primarily by obtaining photographs of **all** National Council members so that people can place faces to the names that they hear and read about so often. Therefore, if you are a member of National Council for 1991 (including National Council Representatives) I would appreciate it greatly if you could forward to me a black and white "passport style" photograph of yourself as soon as possible.

Also, while on the same topic, it appears that everyone missed one of the recommendations of the Publications Committee that was circulated as Appendix B to the Minutes of the September 29th, 1990 National Council meeting. It concerned the new format for the *Annual Report* and states that "Each Centre will be expected to submit one photograph representing their ac-

(continued on page 8)

BULLETIN

is a publication of the Royal Astronomical Society of Canada and is distributed together with the Society's Journal. It contains articles on current activities of the Royal Astronomical Society of Canada and its Centres across Canada, as well as articles from members and non-members which are of general interest to members of the Society. Manuscripts (in English or French) should be submitted to the Editor at the address below. Inquiries about the Society should be directed to its National Office at 136 Dupont Street, Toronto, Ontario, Canada M5R 1V2.

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Event Horizon

Saturday, April 20
International Astronomy Day

May 17 - 19
1991 General Assembly
Vancouver, British Columbia
Contact: Organizing Committee, 1991 G.A., R.A.S.C. c/o 1100 Chestnut Street, Vancouver, B.C. V6J 3J9

August 11 - 14
Statistical Challenges in Modern Astronomy
The Pennsylvania State University
University Park, Pennsylvania
Contact: Eric D. Feigelson, Dept. of Astronomy and Astrophysics, The Pennsylvania State University, 525 Davey Laboratory, University Park, Pennsylvania 16802

August 30 - September 2
NOVA EAST '91
Fundy National Park, New Brunswick
Contact: Doug Pitcairn, 13 Ferguson Road, Dartmouth, Nova Scotia B3A 4J8

It's our U.F.O. to somewhere else! [On the Voyager spacecraft]
J. Allen Hynek, American Astronomer (1981)

Letters to the Editor

Astronomical Glasnost

Would you like to have a personal role in glasnost? You could share ideas with the P.E.R.M. Amateur Astronomers, and maybe share your old *Journals* with them. A letter was recently received at National Office, written in good English, telling of their 0.2 metre telescope and their work on a 0.5 metre one. Write to:

СССР
Г. Пермь, 614068
УЛ. Лунагареиого Д. 99/6 КБ.46
Сергею Беллеру (Sergei Belleru)

[Editor's Note: Soviet addresses are written in the opposite order to ours. Note that the first line contains the Soviet equivalent of U.S.S.R., made familiar to all of us from their national hockey team's sweaters!]

This is our REAL address

Some correspondents have persisted in sending R.A.S.C. Edmonton Centre mail to either of our two previous addresses: c/o The Queen Elizabeth Planetarium and c/o The City of Edmonton Parks and Recreation at Edmonton's C.N. Tower. Such mail is seldom forwarded expeditiously to the Edmonton Centre. Our correct address is:

Edmonton Centre, R.A.S.C.
c/o Edmonton Space and Science Centre
11211-142 Street
Edmonton, Alberta
T5M 4A1

Catherine Breckenridge
Edmonton Centre Secretary

Courageous Astronomer

I received your address from a friend of mine. He is physically disabled and reads American journals for disabilities. He told me you wished information of people with disabilities. In fact, I have been physically disabled in a wheelchair since 1959. When I was fourteen years old I jumped into the river Sava in Zagreb and hurt my neck and so I am C-5 tetraplegic now. I have lived in a hospital for thirty-one years. (Perhaps it is an event for Guinness' Book of Records!)

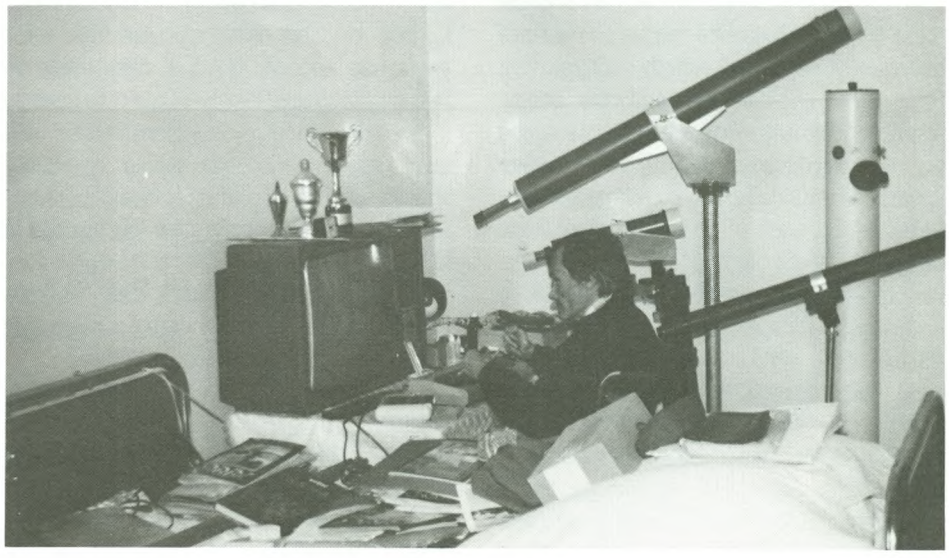
Of course, it is important that my hobby is astronomy, and especially, making telescopes. In fact, I am the only tetraplegic amateur telescope maker in Yugoslavia, and I think there are few, so badly disabled, constructing telescopes in the whole world. If you know of any in America, could you please tell me.

I have made a few refractors and reflectors (Newton's telescope) since 1975. It is adapted to use in a wheelchair (the altazimuth type). A reflector telescope of mine is published in *Covjek i svemir*, the journal of the Astronomical Observatory in Zagreb. Astronomy is my favourite hobby but I am also fond of chess, amateur radio and computers.

I send you a picture *[see below]* so you can see my telescopes and study. I have lived with other patients in this room for twenty-seven years. I wish I had a single room...

In the end, may I ask you for something? In fact, I want to know what is the price for a good achromatic object lens of 90 mm diameter, focal length 1200 mm, in America. If you know, please write me. I look forward to hearing from you as soon as possible.

Zeljko Kunej
Ortopedska bolnica, 51262 Kraljevica, Yugoslavia



Zeljko Kunej in his hospital room in Kraljevica, Yugoslavia. Four of his homemade telescopes are visible in the background.

PETER MACKENZIE MILLMAN, 1906-1990

Ian Halliday
Ottawa Centre
reprinted from **Astronotes**

Canadian astronomy lost an outstanding researcher and the Ottawa Centre lost one of its most devoted members with the death of Dr. Peter Millman on December 11th, 1990.

Peter Millman's lengthy career in Canadian astronomy began more than six decades ago as a summer student at the Dominion Astrophysical Observatory in Victoria. Following postgraduate studies at Harvard University he returned to the University of Toronto as one of the original staff members of the David Dunlap Observatory. Wartime service in the R.C.A.F. included postings in Ottawa and overseas, where he was involved with many aspects of operations research. His astronomical career resumed in 1946 in Ottawa when he joined the Dominion Observatory to establish an active program of meteor research. Moving to the National Research Council in 1955, Dr. Millman headed the Upper Atmosphere Research Station until his formal retirement, but continued his research activity for the remainder of his life. He was one of the first retired scientists to be honoured with the title of Researcher Emeritus by the N.R.C.

More lengthy tributes to Peter Millman will appear in the Society's *Journal* and in other publications. They will, of course, document his scientific achievements and the international recognition they attracted. Members of the Ottawa Centre had an opportunity to know Peter personally and he will be remembered for his enthusiastic support of all the Centre's activities. He was an excellent lecturer and was always willing to share his knowledge with others. In recent years he especially enjoyed many talks with school groups, passing on his love for astronomy to younger generations. As recently as March, 1990, Dr. Millman spoke at a lecture meeting of the Ottawa Centre, explaining the intricacies associated with mapping other planets and satellites in the solar system. In spite of failing health, Peter and his wife Peggy attended the Annual Dinner Meeting of the Ottawa Centre in November, his last attendance at a scientific meeting.

Peter Millman will be greatly missed by all who knew him through any of his many interests and hobbies. The Ottawa Centre joins in an expression of sincere sympathy to his wife Peggy, their children, grandchildren, and other members of the family. ✪

R.A.S.C. Promotional Items

Support your local group! Wear one of our R.A.S.C. golf shirts to the eclipse or to your favourite astronomical convention this summer. Details of our promotional items are as follows:

R.A.S.C. Golf Shirts: White jersey material, 50/50 polyester/cotton with knitted collar and button opening. Adult sizes: S,M,L,XL with a 75 mm diameter navy emblem screened on the upper left.

R.A.S.C. stickers: White, round vinyl self-adhesive stickers, peelable backing with a 90 mm diameter navy emblem imprint. Ideal for your telescope, clipboard, suitcase and car bumper!

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Item	Price	Shipping
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Stickers	$1	$1 per item or batch
Keychains	$4	$1 per item or batch

These figures include all taxes. Items are available by sending a Canadian cheque or money order, payable to *Royal Astronomical Society of Canada* to:

R.A.S.C. Promotional Items
c/o Mrs. C. L. Cresswell
78 Tormore Drive
Richmond Hill, Ontario
L4C 3N5

Phone inquiries can be made to (416) 884-3858. Where possible, delivery will be arranged to avoid shipping charges completely.

Officers Appointed

The following people were appointed to the positions of Recorder and Librarian at the February 2nd National Council Meeting. Mary Anne Harrington is the new Recorder, taking over the position from Henry Lee. Cathy Cresswell is the Society's new Librarian, assuming the position from Brian Beattie. Photos and short biographies of the new officers follow.

Recorder

Mary Anne Harrington is a Registered Technologist, having graduated from the Toronto Institute of Medical Technology in 1971. She presently holds the position of Senior Medical Technologist in the Tropical Disease Unit at Toronto General Hospital.

Mary Anne joined the Toronto Centre of the R.A.S.C. in 1984 and soon became very involved in Centre activities. She joined the Toronto Centre's Council in 1985. She has held various positions within the Toronto Centre over the years including Co-chairman of the New Members Committee, Recorder and National Council Representative. She presently holds the position of First Vice-President and is Chairman of the Banquet, Editorial and Finance Committees as well as Editor of the Centre's newsletter, *Scope*.

In 1988 she was presented with the *Bert Winnearls Award* for her contributions toward the operation of the Centre and in 1989 she was presented with a *5 Year Membership Certificate for Service*.

Mary Anne Harrington

Librarian

Cathy L. Cresswell is an enthusiastic amateur astronomer with particular interests in meteors and comets. Her educational background is in business administration. Previous positions held within the R.A.S.C. include Vice-President and Observer's Group Chairman of the Ottawa Centre, and Council Member for the Toronto Centre. Currently she is member of the Ottawa Centre and Treasurer for the Hamilton Centre.

Her other interests include photography, folk art and high-power target rifle shooting. She has represented Canada internationally at the Commonwealth Rifle Matches in Bisley, England. Born in Nanaimo, British Columbia, she resides in Richmond Hill, Ontario. ✪

Cathy Cresswell

Off the Deep End: Two Amateurs Try the Real Thing

Mary Lou Whitehorne
Halifax Centre
Chris Brown
Winnipeg Centre

Spectroscopy and photometry are two important tools in astronomy, but amateurs rarely get a chance to use them. Even professionals rarely get to use them simultaneously. Thanks to the R.A.S.C., Chris Brown and I are in the middle of just such a project. The story goes something like this:

Chris and I met at the 1989 Sydney General Assembly where the Winnipeg Centre applied to National Council for a grant to allow them to purchase the remaining necessary equipment for their photoelectric photometry program. Obviously they were doing some serious astronomy! Meanwhile, I had been involved in an observing project in Halifax having to do with B*e* stars. Contrary to the opinions of some people, B*e* stars are exciting and interesting to observe spectroscopically. Wouldn't it be interesting, I thought, to try a joint spectrographic-photometric observing project on B*e* stars? I approached Chris with the idea and he agreed that we should try it. All we had to do was figure out the best angle of attack. Easy! Or so we thought.

After some discussion, we had a pretty good idea of the capabilities of the equipment each of us had to work with. Chris would be using the Winnipeg Centre's Glenlea Observatory with their C-14 and the University of Manitoba's Optec SSP-3a photometer. I would be using the Burke-Gaffney Observatory's 0.4 metre Cassegrain, which the St. Mary's University Astronomy Department graciously agreed to let me use one night a week.

Obviously, we would have to choose our stars carefully. The first step was a search through the *Bright Star Catalogue* for good candidates. We looked for B*e* stars with appropriate magnitudes and coordinates that would be accessible to both observers. Winnipeg and Halifax differ in latitude by only five degrees, so we were not limited to a narrow band of declination. Magnitudes, however, presented a problem. The edge of the observable universe for my spectroscope is about fifth magnitude. A magnitude five star can be recorded in about one hour, depending somewhat on the star's altitude above the horizon. A magnitude six star requires an exposure time approaching three hours! Not practical! Accurate photometry is difficult when a star is low in the sky, so "horizon huggers" we out, no matter how bright.

These basic limitations gave us a list of fifteen possible candidates. Then we had to check more closely to see if there were good comparison and check stars for photometry, and to see if there were nearby stars that could be confused with the program stars. Nobody wants to waste the night taking the spectra of the wrong star! Preferably, the stars would also be spread around the sidereal clock so that we could observe year round. Well, we got our list and it included the following objects: φ Per, 13 Tau, 28 Tau, α Leo, ζ Tau, κ Dra, 4 Her, γ Cas, EW Lac and θ CrB.

Weather in the Maritimes presents astronomers with a real challenge. Having one night a week on a heavily booked telescope is a wonderful privilege. But how many of those nights would actually be clear? At least the Moon would not interfere with things; none of our stars were likely to suffer an occultation! What has turned out to be the case is this: my nights were seldom clear. Invariably, I would find myself at the telescope late at night, after the scheduled students were finished with their observing projects. Fortunately for us, such students are seldom scheduled to use the telescope after midnight. This affords dedicated (i.e. crazy) amateurs, like myself, a much better chance to actually get some observing done.

Initially we had hoped to be able to make near-simultaneous observations. For this, we established electronic mail accounts so that we could communicate easily and rapidly about observing conditions and results. It immediately became apparent that the weather was not on our side. The best we could do was observe through every break in the clouds and hope for at least a few occasions when it would be clear in both Halifax and Winnipeg. We weren't asking for much, were we? Statistically speaking, time critical observations in the visible range between two widely spaced locations in Canada are impossible to achieve!

As we progressed with our observing, other irritating glitches sometimes arose. For example, κ Dra is an object with a very high declination. This lead to an odd difficulty; the necessary orientation of the telescope caused the base of the spectrograph to run into the telescope's pier, making the star inaccessible for much of its path about the celestial pole. Scratch that one!

B*e* stars are low amplitude, irregular variables, with changes occurring on both short and long time scales. (For more information on the general properties of these stars, see Whitehorne, J.R.A.S.C., Vol. 83/5, 1989, p. 277) The shorter the time scale, the greater the resolution required to see the changes. The more readily observed changes are seen over longer time scales, so we settled on a two year program beginning in the fall of 1989. That first winter we observed all of the stars as often as possible to see which one (or ones) showed signs of doing something interesting.

They are all different spectroscopically; see Figure 1 for an example of the widely varying appearance of B*e* stellar spectra. The three major phases that these objects exhibit, are represented here. The "normal" B phase (note the rotationally broadened lines) is seen in α Leo and θ CrB. The emission phase is seen in 28 Tau and the shell phase is shown by ζ Tau.

By the end of the spring we had accumulated a fair stack of observations. All of the stars were sitting there placidly - doing nothing - at least nothing that we could detect with our small telescopes and low resolution. All except one: φ Per showed subtle changes! This is what we wanted; a star to concentrate on.

The next step was to observe φ Per as often as possible and for as long as possible before its seasonal motion made it inaccessible. We began in September 1990 and finished by the end of February 1991, when φ Per was sinking in the west. By "finished", I mean that we were finished the easy part - getting the observations. The hard part is trying to interpret the changes we detected. We are still working on this.

We plan to present the results (so far) of our joint project to the members of the R.A.S.C. at the 1991 Vancouver General Assembly because we believe that our observing project is unique among amateurs in Canada.

Our Society has another program that we will be utilizing: the Speaker Exchange Program. It exists primarily to help smaller centres bring in speakers, but it can also be used in conjunction with projects like ours. In May, I will be travelling to Winnipeg to speak about the "Halifax connection" of this joint project. Sometime in the fall of 1991, Chris will travel to Halifax to talk about the photometric side of our observing program.

The R.A.S.C. is a unique organization, without whose programs we could not share our observing experiences so readily with other members. We hope that by sharing our experience with the Society in these ways, that others will be encouraged to study more closely, the stars that fill our night sky with such incredible beauty. You might be surprised at how much you can do with relatively modest equipment. And there is the added bonus of having, what our National President, Damien Lemay, calls "some serious fun"! ✪

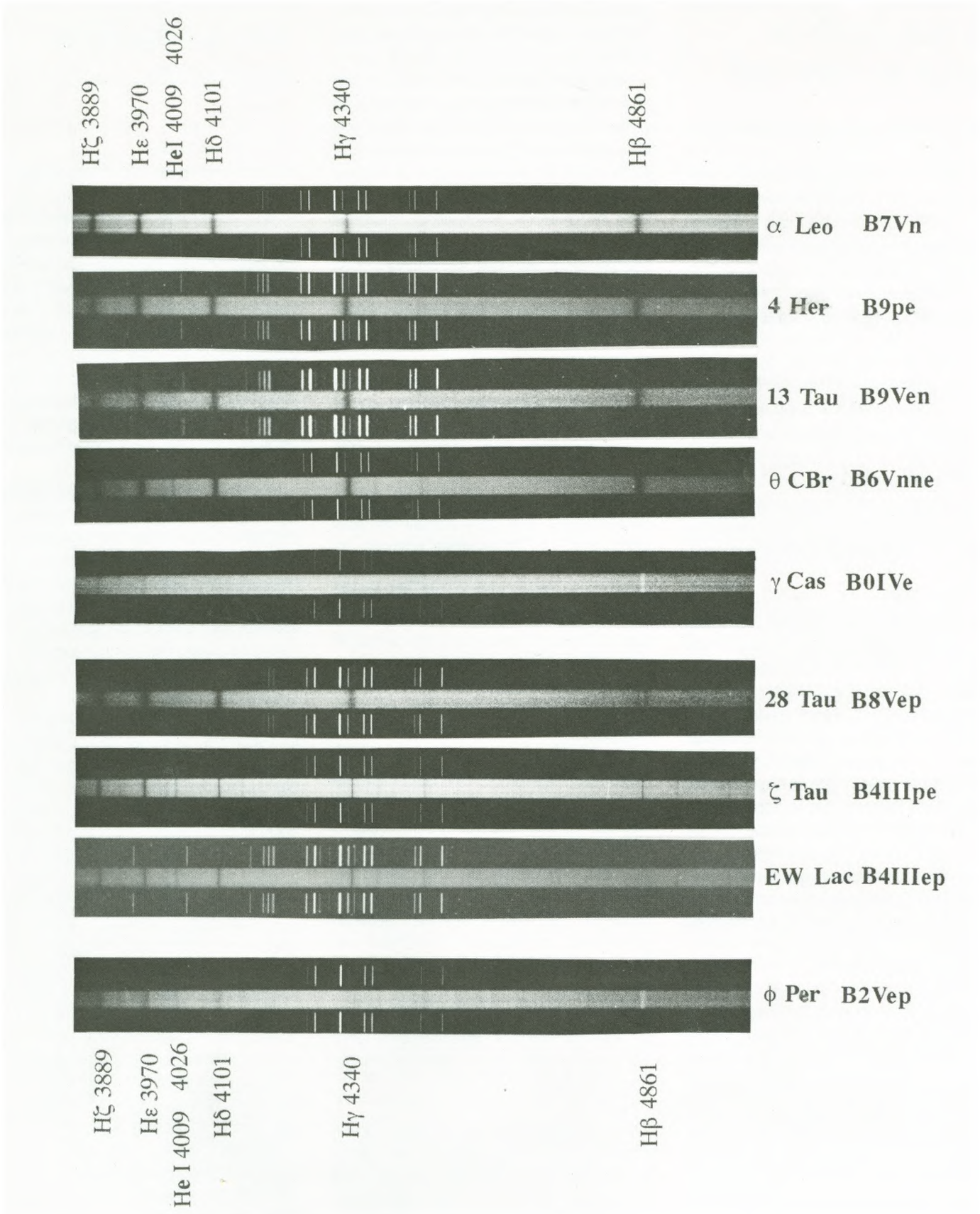

Figure 1. Several Be stars demonstrating the differences seen in the spectra of this type of star. α Leo is a normal B star that had one episode of H-alpha emission several years ago. 4 Her, 13 Tau and θ CrB look like normal B stars but have H-alpha in emission. The H-alpha line is off of the diagram to the right in these spectrograms. γ Cas is in a Be phase with the hydrogen lines showing varying degrees of emission. 28 Tau, ζ Tau and EW Lac are showing shell-type features in their spectra with some lines in emission and some showing deep, sharp emissions cores. φ Per shows hydrogen emission of varying degrees with time and is the subject of further study by the authors.

La dichotomie de Vénus en 1989-1990

par Marc A. Gélinas

ABSTRACT:

Observations of Venus were made by three Canadian amateurs, to study the phase anomaly, also called "The Schroeter's Effect", whereby Venus appears to be half full at a different time then would be expected by its orbital position. The time difference was about three days at both the evening and the morning apparitions in 1989-90. This result comes from more than 30 phase estimations at each apparition that were analyzed graphically to find the best fitting parabolic curve among them. This curve was compared to the theroetical date of the dichotomy. The success of this kind of project results from having a large number of observers spread over a large territory. Amateurs interested in joining such a program in 1991 are invited to contact the author for instructions (See address in masthead).

INTRODUCTION.

En 1989 et 1990 Vénus fît deux apparitions consécutives, l'une dans le ciel du soir et l'autre dans celui du matin. Trois observateurs: Jean-François Viens de Charlesbourg, avec des télescopes Newton de 11 cm et 25 cm; Todd W. Lovinenko de Winnipeg, avec un Schmidt-Cassegrain (S-C) de 20 cm; et Marc A. Gélinas de l'Ile Perrot, avec une lunette de 15 cm et un S-C. de 20 cm. ont mis leurs observations en commun. Ceci a permis en particulier, de déterminer le moment de la dichotomie avec une précision bien meilleure que lorsqu'un seul observateur s'attaque au problème. Nous vous présentons aujourd'hui les résultats de cette analyse.

L'EFFET SCHROETER :

Rappelons que la différence de temps, entre le moment où la dichotomie est observée et celui où elle était prévue, est nommée "Effet Schroeter", d'après cet astronome du XVIIIè siècle qui fut le premier à signaler le phénomène. Tout se passe comme si la phase observée était plus faible que la géométrie ne le permet. Ainsi, aux élongations du soir la dichotomie s'observe avant le moment prévu, alors qu'aux élongations du matin, elle s'observe après. Ce phénoène passe parfois pour une illusion mais il se pourrait aussi qu'il soit du à une cause physique. Entre autres, le Dr John McCue coordonnateur de Vénus à la British Astronomical Association, penche pour un phénomène du type "ombre projetée le long du terminateur par des nuages plus hauts du côté jour que du côté nuit de la planète".

Pour trouver indirectement le moment probable de la dichotomie, tout en évitant les problèmes que la météorologie cause aux observateurs, on utilise une technique statistique. Cette technique, suggérée par le Dr McCue, prend pour acquis que l'effet d'ombre est présent dans les semaines précédant la dichotomie ainsi que dans celles qui la suivent. Donc en pointant sur un graphique les observations de phase en fonction de la date, puis en traçant une courbe parabolique au milieu de ces points on peut interpoler le moment où la dichotomie est le plus probable.

En fait c'est un petit programme informatique qui fait tout le travail. Il utilise la méthode des moindres carrés pour calculer la meilleure courbe et détermine le temps "T" ou la phase "K" = 50%.

LES RESULTATS:

Notre équipe d'amateur a réunis plus de trente mesures de phase à chacune des deux élongations. Les observations retenues ont toutes été faites en lumière intégrée ou en lumière jaune (filtres W15 et W12). On calcule qu'en novembre 89, la dichotomie s'est produite avec 2,78 jours d'avance sur la date prévue, et avec 3,05 jours de retard en avril 90. En tenant compte des incertitudes (±0.3 jour), on trouve une anomalie d'environ trois jours aux deux élongations.

Nous avons dans les deux cas les mêmes observateurs, les mêmes méthodes et la même quantité de donnée. De plus avec la même méthode de calcul nous trouvons un résultat, à toute fin pratique, identique. On peut donc croire que nous avons affaire soit à un phénomène standard, ou alors, on peut se demander si l'anomalie n'est pas le reflet de "l'équation personnelle" du groupe. C'est à dire une tendance involontaire à l'erreur propre à chacun.

CONCLUSION :

Vénus a été bien suivi en 1989-1990. Il y a eu surtout, une évaluation significative de l'effet Schroeter, qui s'est montré constant lors des deux apparitions.

EPILOGUE :

Avec plusieurs observateurs, répartis sur une vaste région comme le Canada, on peut déjouer le mauvais temps local et le manque de disponibilité individuelle (un astronome amateur a aussi une vie sociale). Un nombre élevé d'observateurs augmente également les chances d'avoir des observations simultanées,

(voir page 8)

Introducing Children to Astronomy

Sylvia Smith
Edmonton Centre
Reprinted from **Stardust**

As a substitute teacher I have an interest in educating children. As a parent I wish to expose my children to as many varied experiences as I can. As an amateur astronomer I get to do both.

When my children were old enough to appreciate it, we took a night-time walk. Using a nearby school yard as a "dark site" I pointed out various well-known constellations and asked my children to choose one for themselves. Whenever we go anywhere at night they search for "their" constellation. It has become a fun game and gradually more constellations have been added to their favourites.

Most children begin learning some basic astronomy as part of the school curriculum. Use their teachers as a reference source and pick up copies of work sheets or craft ideas that can be done at home. A "telescope" made out of a toilet paper tube and a piece of paper attached at one end with holes punched out for the stars is an instant hit. Homemade planispheres and solar system mobiles are also interesting projects that children enjoy making.

The public library is also an excellent source for astronomy books geared to children. H.A. Rey (of *Curious George* fame) wrote two children's astronomy books; *The Stars* and *Find The Constellations*. Both are excellent reference material for the young and beginning astronomer. A second author that is highly recommended is Franklyn Branley. His books are interesting, informative and very well illustrated.

It is important to keep in mind that not all children will be interested in astronomy. Those that are should definitely be encouraged. For those that aren't it may be best to just emphasize the "beautiful" aspects of astronomy and incorporate them into other activities that children enjoy. A visit to a park for games, walks and a picnic can be topped off with an early evening astronomy session. It's fun and can help children become more aware of the world we live in.

With light pollution threatening the visibility of the night sky it is conceivable that our grandchildren will see only pictures of the stars. By introducing our children to astronomy and making it a part of their lives we decrease the possibility of this happening. Awareness is just the first step but it is a step that must be taken. As parents and astronomers it is our duty to help children take that first step. ✪

Can the Disk of Jupiter Be Glimpsed With the Naked Eye?

Roland G. Dechesne
Calgary Centre
reprinted from **Starseeker**

Clyde Hostetter's article on the visibility of Venus' crescent in the January 1990 issue of *Sky & Telescope* produced a small but supportive selection of letters by *S&T* readers in the July 1990 issue (Letters section, p. 5-6). Also printed were skeptical comments by P. Steffey. Steffey felt that the unaided eye's resolution and that our foveal cone spacing make our eyes "barely adequate to resolve the crescent of Venus". He followed by stating that anybody who could see the crescent of Venus should also be able to distinguish the disk of Jupiter in twilight, and added that he was unaware of any such sightings.

As part of my daily routine, I often end up at the bus stop at about 7:15 A.M. with a little time to spare. If the sky is clear, I typically spend a few minutes staring up at the stars and planets (the Moon too, if present). During the last few months, Mars has been a fine sight in the western sky while Jupiter has greeted the dawn high overhead. One morning in late October, while examining Jupiter, I was suddenly struck by the fact that Jupiter was not a point of light, but rather, a small disk. While I was certainly aware of Steffey's views at the time, I was not trying to see the disk nor was I thinking of his comments while I was looking up. Neither Mars nor Sirius gave any hint of resembling disks.

I have tried to repeat these observations on every subsequent clear morning. In every case, Mars and Sirius still look like points, while Jupiter, on occasion, is resolved into a disk. The hit or miss nature of these observations suggests to me that near ideal conditions are required to resolve the Jovian disk. Three important controls are likely to be:

1. PHYSIOLOGICAL EFFECTS

The main point to be considered here is temperature. Cold temperatures cause watery eyes and, under extreme conditions, shivering. Obviously, eagle-eyed observers will want to avoid both of these in order to maximize resolving power whether with the naked eye or with a telescope.

2. GLARE FROM JUPITER

As I wrote in the October 1990 issue of the *STARSEEKER*, there appears to be an optimum sky darkness for observing extended objects (Mars, in that instance). In that case I was referring to telescopic observations and how too high contrast may make certain features difficult to see. Telescopes reduce the true contrast through the use of magnification to give us an apparent contrast at the eyepiece. At the lower magnification at which naked eye observations are done (1x), smaller true contrast is required. Unaided observations are thus best carried out under brighter skies than normally used for telescopic observations.

3. RESOLVING POWER OF THE EYE

As Steffey stated, the resolving power of the eye is a function of two things: the diffraction-limited resolution of the lens, and the spacing of our cones. Steffey said that the former is about 1 arc minute (60 arc seconds) and the latter corresponds to 20-40 arc seconds. By my calculations, using the expression published in the R.A.S.C. *Observer's Handbook*, the theoretical diffraction limited resolving power of any optical instrument is: 120/ (lens diameter in mm), or for a dark-adapted eye 17.1 arc seconds (120/ 7mm)

Thus a dark-adapted pupil should not have any problem resolving Jupiter's disk which is always greater than about 30 arc seconds and presently greater than 40 arc seconds in diameter.

Or should it? Spherical and chromatic aberrations become more important in the wide open pupil and better results may be obtained if we could "stop down" the aperture slightly. The easiest way to stop down the pupil (that I know of) is to observe under twilight skies. This will reduce the theoretical resolving power slightly but should give rise to better true resolution. For example, if the sky was twice as bright as under perfect dark adaption, then the pupil might let in half as much light (for simplicity, other factors are ignored) and have a diameter of 5 mm. This corresponds to a theoretical resolving power of 24 arc seconds, still good enough to resolve Jupiter's disk.

A.C. Guyton, in his *Textbook of Medical Physiology*, suggests that the maximum visual acuity for distinguishing two points of light is 26 arc seconds, though his rounded values for resolving two spots are: 2 micrometres apart on the retina, with a 17 mm focal length. These values point to a resolving power closer to 24 arc seconds. Cones in the fovea are spaced at 1.5 micrometres, or 18.2 arc seconds.

I decided to "see" what my eyes were capable of. According to recent eye tests, my eyes were better than 20/20. Thus my eyes should be able to see features that would be at the limit for many people. I pencilled pairs of dots onto a piece of paper and measured the greatest distance at which I could see them. I soon found that as I walked away from the paper, I lost sight of the dots before I could no longer resolve them (this is akin to walking away from two artificial stars and having them drop below your limiting magnitude before they fall below your resolving power). I darkened the dots and drew several other, closer spaced sets so that I could evaluate the effect of dot visibility. My pupil diameters were measured by my sister, as being 3 mm. The results of the experiment are as follows:

Dot Spacing (mm)	Maximum Distance (mm)	Effective Resolution (arc seconds)
4.00 (6.00)	9140	90 (135)
2.00 (3.75)	7010	59 (110)
1.00 (1.75)	3660	56 (99)
0.50 (0.66)	1980	52 (69)
0.25 (0.40)	1220	42 (68)

The dot spacing is the centre to centre distance of the dots. The value given in parenthesis corresponds to the outside edge to outside edge distance.

Because I was experimenting at the very limit of the eye's capability, it is unknown whether I was measuring the separation of the dots (true resolving) or measuring the last recognizable elongation of an image formed by two overlapping dot images, hence the values in the parenthesis.

However, since I very clearly resolved the 4.00 mm spaced dots at 7010 mm (= 118"), I suggest that the result with the 2.00 mm dots at that distance represents separation (59") and not elongation (110").

Interestingly, my maximum resolving power, 42 arc seconds, is just about what one would expect for a 3 mm lens (40 arc seconds).

IMPLICATIONS FOR JOVIAN DISK VISIBILITY

Even with my moderate daylight pupil diameter (3 mm) I should be able to just barely detect the disk of Jupiter (presently 41 arc seconds). At twilight, enhanced resolution because of a larger pupil means that viewing the planetary disk is a distinct possibility. Note that twilight a) reduces glare and b) stops down the pupil from its maximum to reduce optical aberrations. Not recognizably resolving Mars' orb at 18 arc seconds certainly places limits on my twilight resolving power.

Working at the limits of one's eyes is far more difficult than working at the limit of a telescope. Under good conditions with a telescope, one can be sure whether a binary star is cleanly

(continued on page 8)

Can the Disk of Jupiter Be Glimpsed With the Naked Eye?

(continued from page 7)

resolved or merely elongated, since the resulting image is spread across tens or hundreds of cone cells. With the naked eye, as few as two or three cells may be involved. As well, my test, which required me to recognize an elongation, should be easier to do than distinguishing a small disk from a dot. This suggests to me that my twilight resolving power must be quite a bit better than the apparent size of Jupiter for me to recognize it as a disk. Finally, seeing Venus' crescent and the elongate shape of Saturn should be easier feats. ✪

My Second Editorial

(continued from page 1)

tivities. The Editor will select some of these for inclusion". As I received very few submissions, I hope that this will serve as a sufficient reminder to take a few extra photos in the coming year.

Lastly, I sent a letter to all centre editors at the end of last November stating that I would probably not have time to sift through individual newsletters to produce the *Across the R.A.S.C.* feature and that centres would have to supply their own material. This has proven to be the case and I would like to thank those centres that contributed material. If your centre is not represented, check with your executive to find out why, or better yet, volunteer to submit material on behalf of your centre! ✪

La dichotomie de Vénus en 1989-1990

(continuer à page 6)

pouvant confirmer ou infirmer des phénomènes inhabituels comme la lumière cendrée ou des taches sur les nuages. Dans la détermination de la dichotomie par statistique, le grand nombre permet de réduire les erreurs systématiques qui ont alors tendance à s'annuler.

On doit donc souhaiter une participation accrue des amateurs à la surveillance de Vénus. J'invite les amateurs intéressés à un projet national de surveillance de Vénus en 1991, à communiquer avec moi pour obtenir les renseignements nécessaires. Depuis plusieurs années que je participent à l'observation de Vénus auprès de la BAA et de l'ALPO, je sais que les membres de la S.R.A.C. ont une bonne réputation. Nous avons aujourd'hui encore l'occasion de faire notre part dans la coopération internationale dans le monde de l'astronomie amateur. ✪

Across the R.A.S.C.

Edmonton

Our Annual Meeting was held on January 14th. Awards presented included:
Telescope Maker of the Year : **Paul Campbell**.
Astrophotographer of the Year : **David Roles**.
Observer of the Year : **Dave Clyburn**.
Presidential Award : **Karen Gray**.
*Observers Group Award**: **Larry Wood** for his enthusiastic observations of invisible objects.
*This new award is the Centre's version of the coveted Brownie Badge for Astronomy.

Vancouver

We regret to note the death, last September, of Mrs. James Greer, a life member of our Centre since 1962. Her father was Walter J. Helm whose bequest to the Society in 1960 established an endowment fund to benefit the David Dunlap Observatory. Some members may recall that the portrait of Mr. Helm, which hangs in the observatory library, was unveiled by Mrs. Greer at the 1965 G.A. in Toronto.

The December meeting started out with the usual Annual General Meeting genre. After reports and updates, the main speaker, Dr. Steve Straker of the U.B.C. History Department took the floor. He gave an interesting discussion on the various historical theories of light and how they were proven incorrect by Kepler's observations during solar eclipses.

January's meeting was cancelled due to SNOW! The regular January "New Moon" observing at Aldergrove Lake was quite good although frost, not dew this time, did pose some problems. Dr. Gordon Walker spoke on the two new 8-metre telescopes being built jointly by Canada, the U.S.A. and Britain. Being one of the project scientists, he was able to provide insight into the many and various problems facing the project and the great benefits that will be obtained from them.

Hamilton

The new year has started with an exciting innovation for the Hamilton Centre. The numerous special groups hosted by the Centre are now treated to an evening of astronomy eduction in the planetarium at McMaster University, and all groups so far have been very enthusiastic about the new venue. Thanks are extended to Doug Welch whose organizational skills made this possible.

The major task of compiling an inventory of all Centre property is now being undertaken by Cathy Cresswell and Mike Jefferson. Subsequent to the renovation of the library, this facility has now proudly been officially dedicated as the Ian W. M. Stuart Memorial Library. Observers' nights/workshops, organized by Ev Butterworth, continue to be very well attended and enjoyed by both new and longtime members. There was even one held in January on a clear night! ✪