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Reflections: The Caldwell Catalogue: Why All the Hype?

Leo Enright
Kingston Centre

Less than a year ago, amid considerable fanfare, the Caldwell Catalogue made its appearance. It was an attempt by the famous British amateur, Patrick Moore, to provide fellow astronomers with a list of what he considered to be the sky's finest observing targets beyond the Messier list. *Sky & Telescope* devoted six pages to the initial announcement (December 1995, pp.38-43). Since then, another three and half full-color pages have been devoted to informing readers that for about ten dollars they can be the proud owner of a reprint of the original article and a laminated, note-paper-sized map of the sky with the Caldwell objects labelled on it (February 1996, p.4; March 1996, p.47; April 1996, p. 34; August 1996, p.100).

Why the name "Caldwell"? Mr. Moore informed us that Caldwell is a part of his surname that he rarely uses and he chose it to avoid confusing the "M" of Moore with that of Messier. He said that the list would have 109 objects, not 110, because "not many people accept M110, one of the companions of M31, and still prefer to call it NGC 205". This, in spite of the fact that M110 has been part of the Messier list in the *Observer's Handbook* for the last seventeen issues, that is, since 1980. Also rather notable is the statement that "except for the Astronomical League's 400-object Herschel list, few [deep-

sky observing lists beyond that of Messier] have gained wide popularity." This too is in spite of the fact that the Finest NGC Objects list, an excellent compilation of deep-sky targets, has appeared in our society's *Observer's Handbook* since 1981. The remarkable world-wide circulation of this handbook has made this list available for the last sixteen years.

One would expect that the Caldwell list would contain 109 objects that any of us could observe from our location, given a suitable instrument and a dark site—probably within a two-hour drive for those who live under light-polluted skies. Not so. Moore himself admits that only sixty-seven of the objects can be seen from his own location at latitude 51° . A simple calculation tells me that I ought to be able to see seventy-two of them, but some would be quite low in the southern sky and available for only a very short part of the year. My colleagues in Edmonton would be able to see only 60% of the objects on the list.

Mr. Moore has chosen to list a relatively large number of objects that are in the far southern sky. Six objects are within 20° of the South Celestial Pole. One object, a planetary nebula whose size is listed as 0.6 arc-minutes, is located in the constellation Chamaeleon, only nine degrees from the South Celestial Pole. Such objects, and many others in the last half of Moore's list, are simply too far south to be seen even by those who might occasionally vacation in the Caribbean and expect to complete the list at that time. One would, in fact, need to go much further south in order to catch a glimpse of them, and unless that person went well south of the equator, some of them would still be low in the sky and within view for only a brief time.

An unusual feature of Moore's catalogue is the fact that the objects are listed in order of declination, rather than in the conventional way, by right ascension, or by constellation. Caldwell objects found in the same constellation may be many numbers apart; for example Cygnus contains, C15, C19, C20, C33 and C34. C9 is at right ascension 22 hours, indicating that it is a late summer or autumn object; but so are C30 and C63. The only advantage to listing objects in order of their declination would seem to be that it gives an indication of how many objects on the list may be seen from a given latitude.

As stated previously, readers of the *Observer's Handbook* have had access to "lists beyond the Messier objects" for years. Thanks to the work done by Alan Dyer from 1978 to 1981, users of the handbook have enjoyed access to a number of lists arranged for easy use, season by season, **and** containing throughout all of them, objects that can be easily seen from the mid-northern latitudes. In 1979, Dyer organized the Messier list so that the objects would be arranged by season and by constellation—a notable boon for the observer. In 1980 he compiled a list of 110 of the finest non-Messier deep-sky objects. This list, in which all the items were north of -26° , was organized in the same fashion as the updated Messier list. Both of these lists have appeared in every handbook since 1981.

If this were not enough, in 1981, Dyer compiled a further list, which he called a deep-sky challenge list, which comprised 110 objects, all of them north of -35° , so that the entire list can be seen from our latitude. Those of us within the society who had the fortune of obtaining this list, (continued on page 11)



BULLETIN

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Cover Picture: An aerial view of the University of Alberta, site of the 1996 General Assembly.

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Letters to the Editor

Galileo Was #2

In the June *Bulletin*, it was stated that Galileo made the first telescopic observations. Like the myth that the great Italian made the first telescope, this claim too is incorrect. Galileo appears to have received word from the Netherlands about the newly discovered telescope sometime in August 1609 and his first comments about observing the Moon date from October, though it is very likely that he attempted to discern the nature of the Moon's surface somewhat earlier. Nonetheless, his first attempts at lunar observation were certainly not made before late August, 1609. There exists a manuscript drawing by Thomas Harriot (1560-1621) which has a crude drawing of the Moon dated "26 July, 1609" and marked "5 days old".

Harriot had been educated at Oxford and was immediately hired by Walter Raleigh (later Sir) as a mathematical practitioner and tutor. In 1588 Harriot accompanied Raleigh and Sir Richard Grenville to Virginia as their surveyor. Upon return, Raleigh introduced Harriot to the Earl of Northumberland under whose patronage he

spent the rest of his life working as a scientist. Harriot's first telescopes may have been brought over from the Netherlands or made under his direction by his instrument maker, Christopher Tooke. (As an interesting footnote, Harriot left his "two perspective trunckes" to the "Wizard Earl"—presumably the Earl of Northumberland.)

On the recommendation of, and following Harriot's own first observations in June 1609, Sir William Lower and other of Harriot's scientific correspondents were attempting to use telescopes for astronomical purposes (this demonstrates just how rapidly telescopes were becoming available in England). By July, Lower had made his own observations and returned a description to Harriot. Lower mentions the observation of earthshine, "luminous parts like starres" (presumably peaks at the edge as the Sun was just beginning to catch them), and he goes on to state "In the full she appeares like a tart that my cooke made me last weeke; here a vaine of bright stuffe, and there of darke, and so confused lie all over. I must confesse I can see none of this without my cylinder."

As you can see from the figure, Harriot's map was indeed very crude but it is the oldest extant lunar map (Figure 1) made with a telescope.

Harriot went on to make other astronomical discoveries though, other than describing them to his correspondents, he did not publish the results. His most important contribution was discovering the rate of solar rotation as a result of a series of 199 observations made between December 8th, 1610 and January 18th, 1613. Harriot also prepared a more detailed map of the Moon in 1611 (Figure 2) which shows craters, though it is not clear how strongly he was influenced by reading Galileo's *Sidereus nuncius* in 1610 or whether it was due to an improved telescope. In any case, this new map was still inferior in detail to the map published by Galileo.

Harriot's manuscript maps are held by Lord Egremont and Leconfield. For more information consult: Terrie F. Bloom, *J. for the History of Astronomy*, 9 (1978), pp. 117-122; H.C. King, *History of the Telescope* (1955, 1979); E.G.R. Taylor, *Mathematical Practitioners of Tutor and Stuart England*; or J.D. North's essay in John Shirley, *Thomas Harriot, Renaissance Scientist* (1974).

Randall Brooks
 Curator, Physical Sciences
 National Museum of Science and Technology

The Romans Messed It Up!

Regarding the article by Don Collier "Got some Julian Time on Your Hands". In the body of the article he quotes Archbishop Usher's determination that the date of creation was 1st January 4713 B.C.E. Very odd because the true date, perfectly well known to any scholar worthy of the title, is 1 Tishrei. This event occurred 5757 years ago, thus the date of this little letter is 1 Tishrei 5757. (Sunday, September 21st, 1996). We had a perfectly good calendar until it was messed about by the Romans. This was based on the lunar month as follows: The moon revolving about the earth every 29.5 days, which multiplied by 12 months of the year gives us a

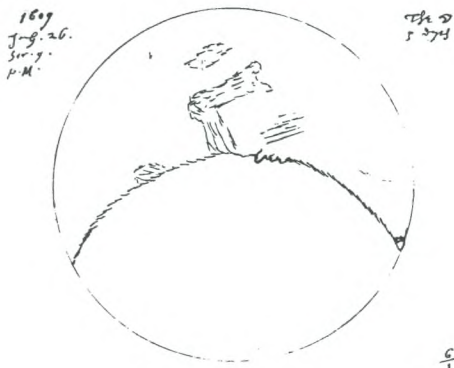


Figure 1

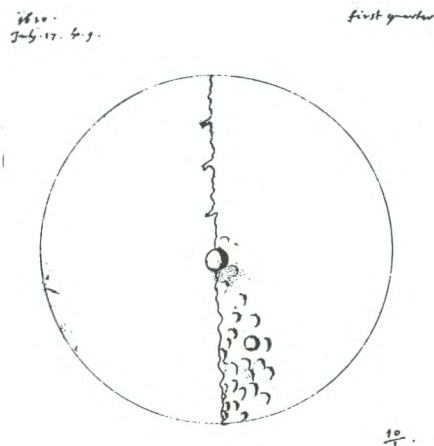


Figure 2

(continued on page 9)

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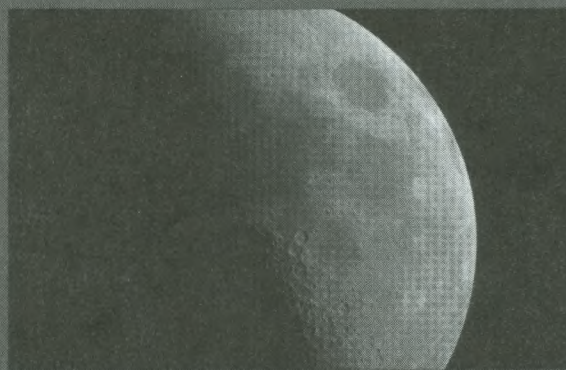
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The Beginner's Observing Guide

*An Introduction
to the Night Sky
for the Novice Stargazer*



Leo Enright

The Royal Astronomical Society of Canada

New Executive Secretary

Greetings to all RASC members! Pat Kelly, the editor, asked me to let you know something about myself, Bonnie Bird, your new executive secretary. There are astronomical influences in almost all aspects of my life—work, volunteerism, friendships and holidays.

Although astronomy is not my forté, one could say that I live and breathe the administrative side of the hobby. For six to eight months each year, I am part of the team of volunteers that organizes Starfest, an astronomy conference held near Mount Forest, Ontario. As chief registrar for all fifteen years of its existence, I have enjoyed welcoming all attendees and their families to Starfest.

In addition to Starfest, my husband, Andreas Gada, and I open our home for astronomy meetings, and our cabin for dark sky weekends year round. Thus, I have become familiar with

the terminology and many aspects of astronomy by osmosis, i.e. consistently being exposed to amateur enthusiasts and their perpetual discussions (astrobabble) about telescopes, and “heavenly bodies”. Andreas is an unattached, life member of the RASC and founder of the North York Astronomical Association and Starfest.

My experiences are not just “armchair” ones. Year round I will go out and look through the telescopes to see again and again the basics—the Moon, Saturn, Venus, M51, star clusters, etc. Although I appreciate the opportunity to see all these pinpoints of light, I quickly retreat to the warm cabin to curl up with a good book!

Even my holidays are now influenced by the hobby. When I was single my vacations included such adventures as backpacking in New Hampshire, the Yukon, Alaska, and the Grand Canyon, river rafting in northern British Columbia, organizing a linguistic library in the Ecuadorian jungle, or participating in an eye clinic in the Dominican Republic. Once married to a keen

observer, however, holidays became solar eclipses in South Carolina, Indonesia, Mexico, and comets (Halley) in Barbados. During October, I will spend a week at the Star Hill Inn in New Mexico. Yet to come are the eclipses in Caribbean in 1998 and Europe, 1999!!! Ahh, it's a rough life sometimes!

Now that I am the executive secretary for the RASC, my working life also revolves around astronomy! In addition to working at the National Office two and a half days a week, I have my own business providing office and bookkeeping services to small businesses. Over the past five years as a free lancer, I have worked in the fields of retail training, fund-raising consulting, gala event management, fireplace manufacturing, fibre optic manufacturing, accounting, and newsletter publishing. Although I love to track finances (bookkeeping), I also organize offices, seminars and conferences. One of the major

(continued on page 12)

Land of the Midnight Venus

John Connelly
Halifax Centre

"The northern lights have seen queer sights but the queerest they ever did see..." (Apologies to Robert Service and Sam McGee)

Venus still high in the sky at midnight! Venus moving from the evening sky, over the northern horizon and into the morning sky without setting! When the conditions are right, this event can be observed within a narrow band of latitude, which crosses the Canadian arctic, as it was this April. The writer calls this area "The Land of the Midnight Venus".

By fortunate coincidence, I was in the right place at the right time to witness this phenomenon. On April 20th of this year, I was in the solidly frozen delta of the Mackenzie River near the Arctic coast northwest of Inuvik. My latitude was just south of 70° north. Venus, dominating the long arctic twilight, blazed away at magnitude -4.5, high in the northwest over the white, snow-covered landscape.

The sky's glow slowly dimmed, but did not disappear, as the Sun sank to 8° below the horizon at midnight, solar time. First magnitude, and the brighter second magnitude stars, struggled to make their presence known. (Yes, Sam, there were some great multi-curtain displays of aurora.) I was disappointed that I was not able to detect shadows cast by Venus because of the remaining twilight glow and the bright aurora. Suddenly I realized that Venus was too high in the sky to set and that I was about to witness the unexpected phenomenon of Venus passing from the western evening sky to the eastern morning sky without setting!

Venus reached its low point of some 6° above the horizon about half an hour before sunrise and began to climb into the morning sky to the northeast. Venus, almost at maximum brilliance, was lost to sight just as the first rays of the rising Sun flooded the white landscape.

On returning to my home in Nova Scotia, I set about the task of explaining what I had seen by consulting the tables and data in the *Observer's Handbook*. This spring, on May 5th, Venus reached a declination of 27° 47', its maximum northern declination for this century. During mid to late April, Venus was close to 27° north of the celestial equator, and therefore only 63° away from the north celestial pole. At all latitudes north of 63°, Venus was circumpolar—above

the horizon twenty-four hours a day. To clearly observe this, one would have to be a few degrees further north so that landforms and trees did not obscure the view of the planet. At 70°, Venus would be 7° above the horizon at the lowest point of its daily, circumpolar journey.

On April 20th, the Sun, with a right ascension of 1h 52m preceded Venus, across the sky by 3 hours and 2 minutes, as Venus has a right ascension of 4h 54m. This means that where Venus was circumpolar, the planet would reach its lowest altitude over the northern horizon at 3:02 local solar time. The further north one goes, the shorter the nights become until, at latitude 78° (on this date), the region of continuous sunlight is reached. At 70°, the sunrise on April 20th was at 3:29 local solar time. Here is the land of the midnight Venus, a narrow band of latitude passing through northern Canada, where Venus shines all night, dips to its low point and begins to climb into the morning sky to the northeast before it is lost in the glare of the rising Sun. If one were to go a few degrees further south, Venus would set before rising again. If you were to go a few degrees further north, sunrise would occur before Venus crossed the meridian from the evening sky to the morning sky and this phenomenon could not be seen by the unaided eye.

Perhaps this report will stimulate some of us who live in southern Canada and are conditioned to think of the sky as a place where objects rise in the east and set in the west, into doing a little computer or armchair astronomy and contemplate the sky of the Canadian arctic where the predominant movement in the sky is circular, around the north celestial pole. A consideration of the Moon's daily and monthly paths across the sky during the polar night and how young a Moon can be seen during that period, makes a good beginning. Better yet, find an excuse to visit the arctic and have a look for yourself! Right, Sam?

[John Connelly is a retired geographer and educator. In addition to the RASC, he is also a member of the Minas Astronomy Group. He has occasion to travel to the arctic several times a year.] ☪

"But indeed, the English generally have been very stationary in the latter times, and the French, on the contrary, so active and successful, particularly in preparing elementary books, in the mathematical and natural sciences, that those who wish for instruction, without caring from which nation they get it, resort universally to the latter language.

*Thomas Jefferson
American president/author (1743-1826)*

The Twenty-four Solar Terms of the Chinese Calendar

Henry Lee
Windsor Centre
reprinted from *Aurora*

The early Chinese, as far back as the Xia Dynasty (2005-1766 B.C.) noted that at certain times of the year the Sun would produce the shortest, and longest, shadows on the ground, and thus discovered the summer and winter solstices. Obviously, this was a purely solar observation.

These two events marked the beginnings of a calendar system called the "Twenty-four Solar Terms". Being an agrarian society, the farmers in China needed a more precise dating system by which to plant their crops of rice, wheat and vegetables. The lunisolar cycle, which was already in use, satisfied social activities for the year. The merging of the two types of calendars was a feat for the Chinese almanac calculators. In the agriculturally productive areas, it was noted that approximately every fifteen days, there appeared to be some significant meteorological change. These changes engendered the beginnings of the twenty-four solar terms, which documented the monthly changes in nature.

The four most significant solar events, the two equinoxes and the summer and winter solstices became the four main points of the solar terms. During the Western Han Dynasty (206-24 B.C.) the ancient Chinese succeeded in inserting twenty more, equally spaced, solar terms between these four.

The twenty-four solar terms, moving counterclockwise around the ecliptic are:

Lesser Cold	Lesser Heat
Great Cold	Great Heat
Start of Spring	Start of Fall
Rain Water	Bounds of Heat
Awakening of Insects	White Dew
Vernal Equinox	Autumnal Equinox
Clear and Bright	Cold Dew
Grain Rains	Descent of Hoarfrost
Start of Summer	Start of Winter
Little Fullness	Lesser Snow
Husks of Grain	Great Snow
Summer Solstice	Winter Solstice

These names are based on climactic conditions in China at that time.

Each solar term covers fifteen days, therefore twenty-four solar terms cover 360 days—the lunar cycle. Now the marriage of the Sun with the Moon has been successfully achieved. ☪

Astronomical Amalgamation

Patrick Kelly
Halifax Centre
reprinted from *Nova Notes*

Halifax, N.S. (CP)—Now that the amalgamation of the Halifax and Sydney metro regions has successfully taken place and the merger between Dalhousie University and the Technical University of Nova Scotia is well underway, the Nova Scotia government has decided to turn its efforts to the night sky. While many of the details are sketchy, internal memos which were obtained from the Department of Astronomical Organization (DAO) under the Freedom of Information Act give an indication of the wide ranging scope of the proposed reforms.

Constellation boundaries will be redrawn to eliminate a lot of the smaller and lesser-known constellations. Coma Berenices (Bernice's Hair) and Canes Venatici (the Hunting Dogs) will be combined into one constellation Coma Canes (the Hairy Dogs). Leo Minor will disappear completely, its small triangle of stars is slated to become a tuft of fur on the end of the tail of Leo. Also slated for removal are Camelopardalis and Lynx, both of which will be added to Ursa Major, making it by far the largest constellation at 2370 square degrees; Hydra will now take a distant second place with a mere 1303 square degrees. According to the DAO memos, it was felt that Canada, being such a large country, deserved to have the largest constellation in the part of the sky that is circumpolar from our latitude.

Also enhancing Canadian content, Crater the Cup will be renamed Crater Stanlius, Stanley's Cup, due to its resemblance to the top of the famous hockey trophy and the fact that it is best seen while the Stanley Cup playoffs are in progress. When asked about this, the Minister of Astronomical Organization, Galle E. Leo, stated that hockey was going over really big in the United States and he could not see that the Americans would object. "Besides, since precession will gradually cause Crater Stanlius to appear later and later into the summer, it will fit perfectly with the recent trend of the playoffs."

The biggest surprise is the merger of Corona Borealis with Hercules. Reminiscent of the Dal/TUNS merger, the crown's asterism will officially become part of Hercules, but will get a new name, which has not yet been decided on. In addition, three new stars will be added to the crown over the next two years in order to strengthen key areas of its shape.

All of the constellations that are being affected, will also have all of their stars relabelled

to avoid duplication of star names. Tradition will be followed, using the Greek alphabet. Due to the large number of stars in the "new" Ursa Major, the Greek alphabet would be followed by the Hebrew, Cyrillic and Arabic alphabets. Since many Arabic (and some Hebrew) characters have a different form, depending on whether they are located at the start, middle or end of a word, the form that would be used would depend on whether the star was located closest to the beginning, middle or end of the constellation.

Constellations are not the only area where reform will occur. Catalogs of astronomical objects have also been updated to eliminate unnecessary duplication. The Messier list will lose at least eight objects. M40, a double star, will be dropped completely. M43 will be merged with M42, the Orion Nebula. Also slated for removal are M30, M55, M72, M73, M74 and M75. This is seen as an attempt to make it much easier for Canadians to complete a Messier marathon, by removing those objects which are too close to the Sun when marathons are undertaken. All of the remaining Messier objects are to be renumbered to eliminate any gaps in the sequence. The Whirlpool Nebula, M51 (M48, under the new system) will actually benefit from the new system as it will now include NGC 5195, which is connected to it.

According to Mr. Leo most astronomers cannot tell the difference between M42 and M43 anyway and it has been a long time since astronomers used telescopes that were so small that the bridge between M51 and NGC 5195 was not plainly visible. "Why, I hear that with a CCD camera, it is even visible from downtown Toronto in a finder scope."

To avoid confusion between objects in the New General Catalog and the two Index Catalogs, the latter will be abolished. All of the objects in the Index Catalogs will be numbered in order of right ascension, but continuing the numbering sequence from the last item in the New General Catalog. As a result, all deep-sky objects will belong to the NGC, making the three letter prefix redundant. Since astronomers use the prefix "N" to identify nova, and "C" might produce conflicts in the event that extensions are made to the Caldwell Catalog, all objects will have "G" as the prefix. Also, there will no longer be a space between the prefix and the number. Thus, NGC 1 becomes G1, NGC 2367 becomes G2367 and NGC WHIZ becomes GWHIZ. It is expected that 10,000 man-hours of labor, 200 kg of toner and 25 metric tons of ink will be saved each year by eliminating the three extra characters in the prefix.

Nova Scotia premier Johannes Savage is quoted as saying that while there is bound to be

opposition to the changes as well as some initial expenses for the productions of new atlases, etc. astronomers will save a lot of time, effort and money in the long run.

When asked for comments, several local amateur astronomers, expressed their doubts that the new system would win many converts. Dust Lane, one of the co-discoverers of SuperNova Scotia was quite skeptical. "Look at what happened when Patrick Moore tried to introduce the Caldwell Catalog. It made a lot more sense than these proposals do and it received a lot of negative feedback. Even after all this time, I don't know of any amateur astronomer who could tell you the Caldwell number of a single object in the catalog."

According to Merrylou B.E. Whitestar, it was just another example of the government not consulting with people before trying to develop a policy. In her opinion, the government should have consulted astronomy groups as well as the National Action Council for the Status of Women. "Everyone knows that women are much better at organizing things than men are, but do you think that they asked us for advice? Besides, if constellations were going to be reorganized, the new ones should have been used to put more women in the sky. After all, most of the constellation figures represent men; a little equality wouldn't have been too much to ask for."

Similar sentiments were expressed by Dewglass MacPitcairn. "I was one of the founding members of the Astronomical Reform Party of Canada and we had made proposals similar to these before the last election." said Mr. MacPitcairn. "Now that the government sees that they really have no choice in this matter and that the people are beginning to lean in this direction anyway, they are making the changes we had suggested some time ago and then they are taking the credit for it."

One amateur who was not immediately critical of the government's plan was planetarium lecturer Pot Belly. "I was training a new instructor one time and he spent half a day trying to learn how to pronounce Camelopardalis properly. When we got into the planetarium, he found that the stars in Camelopardalis were so faint that the projector didn't even have them! Boy was he ticked off! Good riddance as far as I am concerned! Still, I don't think that it has a snowball's chance on the sunny side of Mercury of succeeding. I mean, you can't find a more conservative lot than astronomers. Even so, this sort of thing will generate a lot of interest in amateur astronomers all across the country. What I really like about this whole concept, though, is that I'm the editor of a national newsletter, and I'm a bit low on material for the next

issue. I'd bet that I could get a full page article out of this story!"

Professional astronomers also had grave doubts about the plan. Dr. David Tourniquet, the chairman of the astronomy and physics department at Saint Merry's University, expressed his concerns with the proposals. "It has taken astronomers centuries to perfect coordinate systems and methods of cataloging and naming objects, so that they are totally indecipherable to someone who has not been trained in the field. I mean, even a few astronomers cannot understand the way that these cataloging systems are set up. Well, actually a lot of them don't understand, but that is beside the point. It is sort of like the way that some people have an office or a workshop or a desk that looks like it is a total mess, but yet they know exactly where everything is. The last thing that they want to have happen is for someone else to come in and start trying to clean things up."

When asked whether these changes would be accepted by the other provinces, the premier said that since the sky was not covered under either the charter of rights or the constitution, the province was free to act unilaterally in this area. The premier also said that if these reforms are as successful as it is hoped, the government will start looking at other areas, such as crater names, the possibility of merging many of the solar system's small moons, restricting new comets' names to only the first discoverer and other areas where amalgamation and reform can potentially save money. ☪

Chinese New Year 4694

Henry Lee
Windsor Centre
reprinted from *Aurora*

The Chinese calendar is based on the heavenly positions of both the Sun and the Moon relative to the Earth. The calendar is both lunar and solar and is referred to as a lunisolar calendar. Being lunar, the Full Moon always falls on the fifteenth of the lunar month, plus or minus a few hours. The beginning of the Chinese New Year, is the second New Moon after the winter solstice. This can occur any time between January 20th and February 19th using the Gregorian calendar. The year 4694, "Rodent Year" began on February 19th, 1996.

Year	Western Zodiac	Eastern Zodiac	Attribute
1996	Aries the Ram	Rodent, Rat, Mouse	Shrewdness
1997	Taurus the Bull	Ox, Bull, Cow	Strength
1998	Gemini the Twins	Tiger	Courage
1999	Cancer the Crab	Hare, Rabbit	Independence
2000	Leo the Lion	Dragon	Wisdom
2001	Virgo the Virgin	Serpent, Snake	Cunning
2002	Libra the Scales	Horse	Tenacity
2003	Scorpius the Scorpion	Ram, Sheep, Goat	Health
2004	Sagittarius the Archer	Monkey	Success
2005	Capricornus the Seagoat	Rooster, Chicken	Diligence
2006	Aquarius the Water Bearer	Dog	Honesty
2007	Pisces the Fish	Boar, Pig	Devotion

Since an ordinary lunar year has twelve moons or lunar months, comprised of 354 days, it is necessary to have a "leap month" added to the lunar calendar from time to time, in order to keep it in agreement with the Gregorian calendar.

Legend has it that before his departure from Earth, the Lord Buddah called on the animals to appear. The rat came first, followed by the others, in the order as given in the Eastern Zodiac. Persons, it is alleged, born under the sign of that year will acquire distinct characteristics of that year. Various attributes have been assigned to the legendary animals under which a person is born. A condensed, one word summary is given in the table.

The years are grouped in a repeating cycle of twelve years. This year marks the start of a new cycle, as shown in the accompanying table. ☪

Telescope Making on the Internet

by Gary Seronik
Vancouver Centre
reprinted from *NOVA*

Ah, the Internet. Great well of information. A hopeless collection of clutter. Yes, it is all that and more, but if you take the time to sift the sand you occasionally find a fleck or two of gold. It has been a few months since I first began searching the net for useful sites and have now compiled a list that, although not long, does contain some gold. Here then are the sites I find most useful as an amateur telescope maker:

The ATM Page (<http://www.tiac.net/users/atm>)

This is a great site chock full of useful information. If you are looking for ideas or inspiration, check out the Gallery of ATM Scopes and see how others do it. For those hard-to-find ATM

supplies there is a nice listing in the extensive and searchable Vendor List section. In the Optical Miscellaneous section you will find everything from how not to scratch glass to the fabrication of a Schmidt corrector plate (should the mood strike). If you want to find out how to build your own Crayford type focuser, you just have to look in the "Mechanical Miscellany" section. There is little doubt that this is **the** ATM page.

Mel Bartels' Home Page (<http://www.efn.org/mbartels>)

Who is Mel? Well, you can click on a link at Mel's home page to find out. In short, Mel Bartels is a knowledgeable telescope maker with a good and useful home page. If you want to know how to computerize a Dobsonian or get the facts on collimating a Newtonian, this is the place to go. There is also some nifty software you can download here too. One of the more useful programs I've encountered (DIAGONAL.ZIP) allows you to calculate the size and light drop-off of any given diagonal/telescope combination.

Mark's Amateur Telescope Making Page (<http://webspace.com/markv/telescopes.html>)

Mark's page is an extensive collection of links to other sites and articles that he has found worth reading. There is lots of stuff here and a quick glance down the contents listing will tell you whether or not there is anything that will interest you. There is lots to interest Dobsonian builders and those who are interested in reading about, if not actually making, some of the more exotic designs in amateur hands. This is also the spot to get the wonderful program NEWT20.ZIP which Mark describes as "A cool MS-DOS program for designing Newtonian telescopes. Wish I had this when I built my first one." I second that.

The ATM Journal Home Page (<http://www.halcyon.com/rupe/atmj>)

This is the home page for the magazine, *The ATM Journal* and you can browse selected articles from the current issue or their back issue

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Observing Spiral Structure in Galaxies

Mark Bratton
Montreal Centre
reprinted from *Skyward*

There are few sights in nature that can rival the beauty and sheer majesty of the pinwheeling form of a spiral galaxy. Most of us have been dazzled by colour photos taken of graceful spirals such as M100 or M51 by the great observatories or the Hubble Space Telescope—their yellowish white arms dotted here and there by the electric blues of massive stellar associations or the ruby red patches of gaseous star forming regions.

As beautiful as these images are, however, there is a certain amount of distortion, for time exposure photography allows detail to “burn in” to the film emulsion and the viewer often comes away with the impression that the spiral arms (and certainly the cores) of galaxies are solid, opaque regions.

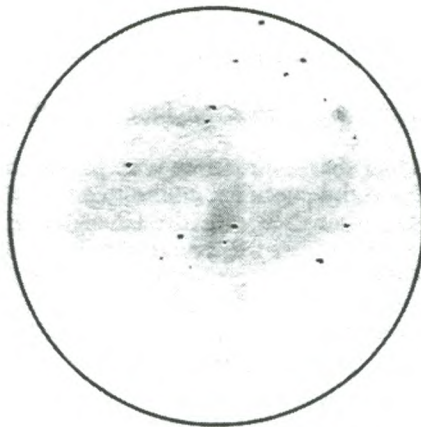
In actual fact galaxies are ghostly, gossamer structures consisting more of empty space than visible matter. How many amateurs have been disappointed by their first views of a galaxy through a small telescope, often under light-polluted conditions? Faint, grayish patches of light, can these really be systems with populations sometimes in excess of 100 billion stars?

To get an idea of just how delicate and elusive spiral structure can be in an amateur telescope one need only look high overhead on a warm summer evening and appreciate the beauty and structure of our own Milky Way. The Cygnus arm will be visible at this time with its dark patches and rifts. We are witnessing here a portion of a spiral galaxy seen edge on and though the unresolved band of light is certainly easily visible one must keep in mind that this spiral arm is certainly no more than 10,000 light years away from Earth. Imagine how faint it would be if it were 250 times further away than it is, say at the distance of M33.

While spiral structure is certainly elusive, not to say invisible, in small telescopes, the situation improves considerably for moderate and large aperture telescopes. Here is an introduction to a few of the sky's more interesting face-on specimens. We will examine four, located at increasing distance from our own galaxy.

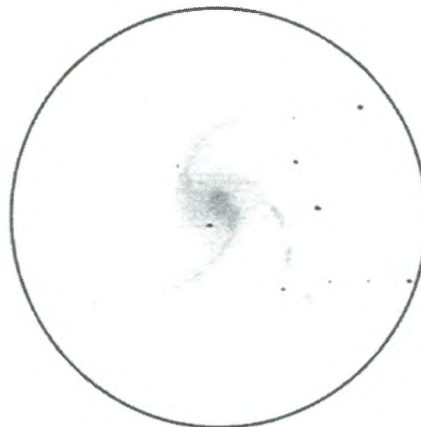
Messier 33

This large, low surface brightness galaxy, a member of our own Local Group, is the nearest galaxy to display spiral structure in amateur



*Messier 33 in Triangulum. 40 cm reflector.
Magnification 90x.*

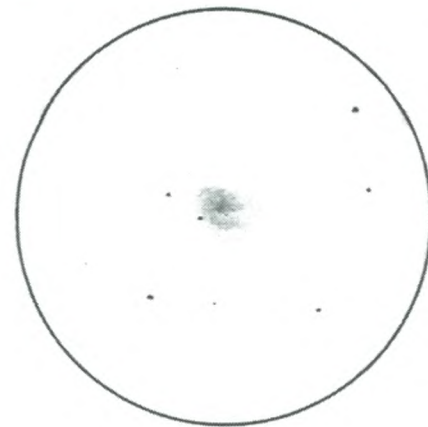
telescopes. A sometimes challenging and frustrating object in a small telescope, the situation improves considerably in apertures larger than 30 cm. Because of its size, many amateur astronomers will attempt to use their lowest magnification in order to surround the galaxy with sufficient dark sky to enhance contrast. When I tried this with my own 40 cm reflector I was able to see the full extent of the galaxy, but little detail. When I increased the magnification from 48x to 90x the situation improved considerably. The effect was to darken the sky background while improving contrast. Now two spiral arms were visible, one curving northwest to north, the other northeast to southeast. The arms appeared mottled with indefinite bright and dark zones. The immense H II region NGC 604 was easily visible at the end of the northern spiral arm. At high magnification this nebula reminded me of what M42 looks like in a pair of binoculars. A second nebula, NGC 595, is visible just west-northwest from the core. Though smaller and fainter than NGC 604 it is nevertheless easily visible. Messier 33 lies about 2.2 million light-years from Earth.



*Messier 101 in Ursa Major. 40 cm reflector.
Magnification 177x.*

Messier 101

A search of the vicinity of M101 in pursuit of NGC galaxies one night in 1994 taught me the importance of dark adaptation when appreciating spiral structure in galaxies. When I first centered the spiral in my field I saw a large, patchy glow of light with a bright core. Sweeping away from the galaxy I spent the next twenty minutes with my eye glued to the eyepiece, tracking down five fainter galaxies. No extraneous light, not even from my filtered flashlight, entered my eye during this time. When I returned to M101 I was shocked to see a bright, fully formed spiral with three distinct spiral arms. The brightest and largest arm, which curved southeast to northeast away from the core, contained three bright H II regions, designated NGC 5461, 5462 and 5471. There are several other NGC objects associated with this galaxy



*Messier 61 in Virgo. 40 cm reflector.
Magnification 146x.*

that were not visible to me on this occasion. Although estimates of M101's distance vary considerably, a recent estimate of 24.8 million light-years does not seem unreasonable.

Messier 51

This is the first galaxy in which spiral structure was clearly identified, the discovery being made by William Parsons, the third Earl of Rosse, in 1845. Because of M51's high surface brightness, spiral structure may be seen in small telescopes under dark skies. I have seen it definitely in a 20 cm Schmidt-Cassegrain when conditions were ideal. In my 40 cm reflector, M51 is a breathtaking sight with two bright and well-defined spiral arms being clearly visible. The core is very bright and on occasion faint extensions are visible toward the companion galaxy, NGC 5195. Of all spirals, M51 appears to me the most dynamic and I always feel immense satisfaction showing it to beginning

(continued on page 11)

Lightwaves: Petitions on Light Pollution

Bill Broderick
Chair, Light Pollution Committee

Petitions are an age-old method of both publicizing and enlisting support for the solution of problems and situations that need correcting. Due to the way that governments operate and decisions are made, however, they are not terribly effective as a means of obtaining immediate change. Even when there is considerable sympathy for what is being requested, nothing very much is likely to be done soon. Although you never know...

As a means of publicizing and enlisting support for your case, however, petitions are wonderful. Signatures can be gathered door to door or at any impromptu or organized function you can arrange, although trying to gather signatures while standing on the street is probably not a good idea.

A mall display or other event for your centre or other astronomy group provides an excellent opportunity for publicizing the problem of light pollution and obtaining signatures on a petition, say to your local municipal council. If part of your display is devoted to light pollution, you can have a sign or poster drawing attention to your petition. Make copies available for signing with several pens handy. Many people besides astronomers enjoy a sparkling night sky and will be more than willing to sign a petition on light pollution. You may even find that other, non-

astronomy, groups such as naturalist clubs, will be interested in circulating your petition for their members to sign.

Lots of Signatures Required

Lots of signatures is what will make the politicians—and maybe even the media—sit up and take notice. How many signatures should you aim for? Obviously, the more you can get the better, however, a good rule of thumb is five percent of the local population. In a municipality of, say 50,000 inhabitants, that means you should aim for at least 2,000 to 3,000 signatures if it is at all possible.

At the provincial level, because of travel and time constraints, you may have to be satisfied with considerably less than five percent, but aim for as many signatures as you can get. A petition consisting of several thousand signatures can be very impressive in terms of convincing politicians that there is support for what you ask. A number of centres and astronomy groups in a province or sizable city, working together, should be able to produce this kind of result with not too much trouble on anyone's part. (I once obtained over 700 signatures on a petition, in a community of about 35,000, with minimal help from other people. I got what I wanted, too!)

What Form Does It Take?

A petition is a formal prayer or plea by one or more citizens to a governing body to do something that is within its authority to do. As such, certain conventions or customs apply. If you intend to petition your local government, say a municipality, you should discuss your intended

petition with your town or city clerk first, both to ascertain the form or kind of wording that is preferred, and also to make sure that what you want is within the power or authority of the municipality to grant. This is basic. Asking for something that is outside of their authority is not conducive to a positive result.

In very general terms, a petition consists of a sheet of paper with the word "PETITION" at the top followed by a statement identifying the body to which the petition is addressed. Next come one or more "Whereases"—no more than three—which set forth the reasons for the petition—that is, the problem. Finally, comes your request, or statement of what you want them to do. The whole document must be clear, proper—and respectful. If it consists of more than one sheet of signatures, the text of the petition must appear at the top of every sheet. There should be a space for a date—the date that the petition is submitted. Spaces are provided below the text of the petition for names (printed), addresses (printed), and signatures. Signed petitions must be originals—not photocopies.

At the bottom of this page is the general form of a petition. This form can be used for a petition to either a municipal government or to a provincial legislature, although it is always a good idea to check with your municipal clerk or MPP/MLA to determine if there is any special wording that they prefer. If you are submitting your petition to a provincial legislature, you may be able to have it presented to the legislature by your MPP/MLA.

A petition to the Parliament of Canada, as might be expected, is even more formal. The

PETITION

TO THE MAYOR AND COUNCIL OF THE CORPORATION OF THE CITY OF: _____

WHEREAS...;

WHEREAS...;

WHEREAS...;

WE THE UNDERSIGNED therefore petition the Mayor and Council of the Corporation of the City of _____ as follows:

(Text of Petition)

DATE:

NAME (printed)

ADDRESS (printed)

SIGNATURE

_____	_____	_____
_____	_____	_____
_____	_____	_____

PETITION

TO THE HONORABLE HOUSE OF COMMONS OF CANADA IN PARLIAMENT ASSEMBLED

The petition of the undersigned residents of Canada who now avail themselves of their ancient and undoubted right thus to present a grievance common to your Petitioners in the certain assurance that your honorable House will therefore provide a remedy,

HUMBLY SHEWETH

WHEREAS...;

WHEREAS...;

WHEREAS...;

WHEREFORE THE UNDERSIGNED, YOUR PETITIONERS, HUMBLY PRAY AND CALL UPON PARLIAMENT TO:

(Text of Petition)

AND AS IN DUTY BOUND YOUR PETITIONERS WILL EVER PRAY.

DATE: _____

SIGNATURES

ADDRESSES

Three horizontal lines for signatures and three horizontal lines for addresses.

suggested form for such a petition is on the top of this page.

A Model Petition on Light Pollution

The next page is offered as a model for a petition to a local municipal government. In the preamble, it explains in concise terms what light pollution is, why it is a problem, and that there are viable alternatives. In the request, it sets forth what we want the municipality to do. If you use it, you are at complete liberty to use it "as is" or make any changes you think desirable.

Presenting Your Petition

While a petition can always be mailed in or delivered by hand to your city clerk, or to the mayor, a presentation to your city council will be much more effective and may even get you some media coverage. This is arranged by calling on or phoning your city clerk and asking to make a "deputation" at an upcoming city council meeting.

When you have been informed of the date and time of the meeting, try to arrange to bring along some supporters, if you can—as many as you can get.

Municipal councils do not allow a lot of time for deputations. Ten minutes is about par. Your oral presentation should therefore be kept short. Leave a few moments for questions and discus-

sion. You might want to supplement your presentation by bringing along copies of IDA information sheets and sample copies of your petition—enough for each member of council plus a few extra, for the clerk, the media, and anyone else who might be present and want a copy.

Just as your petition is clear, proper and respectful, so should be your presentation. When you have finished, you want the doors of communication to be still open to you in the future. Future communication is not encouraged by making people mad at you—so do not make people mad. Remember, light pollution may be something very new to most of these people. This may be their first inkling that "too much light" is a problem.

Conclusion

As I intimated at the beginning, do not expect miracles. Changing people's attitudes, perceptions and practices is not something that can be accomplished overnight. If you are successful in having your city council strike a committee to look at the problem, you will have accomplished a great deal, but if you do not accomplish even that, you will still have succeeded in educating a lot of people about light pollution and you will have left the door open for future deputations.

Good luck—and good petitioning! ☼

Letters to the Editor

(continued from page 2)

year of 354 days, 11 days short of 365. To correct this all one has to do is intercalate a whole month 7 times in every 19 years to form a leap year. The computation works out as described below.

11 x 19 = 209; the lunar year falls behind the Sun by 209 days. 7 x 30 = 210; we add 210 days in seven leap years. 19 x 354 = 6726 The total number of days in 19 lunar years. 19 x 365 = 6935 The total number of days in 19 solar years. 6726+210 = 6936 Which is the total number of days in 19 lunar plus leap years. For those who may point out that there is still a discrepancy of one whole day due to fractions, we simply make a correction by dropping a leap year every 570 years. All very simple eh! The Muslim calendar is calculated along similar lines.

Nathaniel Cohen
32 Roblea Drive, Dartmouth NS B2W 1Y7 ☼

Hey, you're not going to believe this. It [the Moon] looks just like the map.

[Spoken while aboard the Apollo 14 spacecraft in lunar orbit.]

Major Stuart A. Roosa
American astronaut (1971)

PETITION

TO THE MAYOR AND COUNCIL OF THE CORPORATION OF THE CITY OF _____

WHEREAS Light Pollution is detrimental to the science of astronomy in that it is destructive of the nighttime sky and our view of the stars and the Milky Way, which we have enjoyed for thousands of years and which is part of our heritage, and otherwise interferes with people's enjoyment of the heavens and serious scientific research; and

WHEREAS Light Pollution is caused by excessive, unnecessary and inefficient lighting practices which cause glare, light trespass and urban sky-glow, which in turn create hazards, cause annoyance, pollute the nighttime environment with unnecessary light and contribute to other forms of pollution, and constitute a waste of valuable resources and additional expense for taxpayers and the community; and

WHEREAS there are viable, cost-effective and attractive alternatives to present lighting practices, which can provide increased visibility, utility and security, with minimal damage to the nighttime environment;

WE THE UNDERSIGNED therefore petition the Mayor and Council of the Corporation of the City of _____ as follows: That Council adopt a program of street lighting and other lighting under its jurisdiction which takes into account the problems of light pollution and seeks to minimize them. In particular, we ask that:

- (1) All street and other illumination shall consist wherever possible of a mix of HIGH-PRESSURE and LOW-PRESSURE SODIUM LIGHTING, both of which have been repeatedly proven to be much more energy-efficient and cost-effective than MERCURY VAPOR and even METAL HALIDE LIGHTING.
- (2) All future street lights and other installations to consist wherever possible of FULL CUT-OFF or SHARP CUT-OFF FIXTURES, so that light emission is controlled and directed downward to the road surfaces and sidewalks and/or walkways where it is needed, and glare and light trespass eliminated. Such installations produce not only better illumination and visibility but also enhance road safety and overall appearance. By eliminating all "up-light", sky glow is also eliminated or at least greatly reduced.
- (3) A program of replacing existing inefficient fixtures which allow light to shine horizontally and upward, thereby producing glare, light trespass, interfering with visibility, contributing to sky-glow, and wasting energy, with FULL CUT-OFF or SHARP CUT-OFF FIXTURES—over a period of 10 years or such other period which Council may find desirable.

In anticipation of Council's favorable consideration of our Petition, we humbly express our thanks.

DATE: _____

NAME (printed)	ADDRESS (printed)	SIGNATURE
_____	_____	_____
_____	_____	_____
_____	_____	_____

Reflections: The Caldwell Catalogue

(continued from page 1)

now had a superb collection of 220 objects beyond the Messier Catalogue—a wealth of deep-sky object to explore for a long, long time.

Parts of this challenge list have been published in the *Observer's Handbook* since 1982, with a list of twenty challenge objects appearing from 1982 to 1988. Since 1989, we have seen a collection of forty-five deep-sky challenge objects, with Alan Dyer and Alister Ling having revised the descriptions for each object. In other words, beyond the Messier Catalogue, we have two excellent lists of deep-sky objects, conveniently arranged, easy to use and with all of the targets visible from our home observing sites.

One has to ask if the Caldwell Catalogue is necessary. It does contain a few objects that we

could see that are not on either of our lists. I was surprised, however, when I decided to see how many Caldwell objects are already on our Finest NGC Objects list. I did a quick comparison of the two lists, but have not yet compared the Caldwell list with our deep-sky challenge list.

Of the seventy-two Caldwell objects that I should be able to see from my location, I found that thirty-four, or about one half of them, are on our Finest NGC Objects list. These are listed in the accompanying table. Perhaps other deep-sky observers will be able to add to this table, which I have hastily drawn up, or to continue the process by comparing the Caldwell Catalogue with our challenge list.

To stimulate our interest in observing the wonders of the "deep-heavens", most observers need look no further than the listings in our society's own publications—they have been there for a long time, waiting to be used. ☼

Caldwell Catalogue Objects Which are Found in the RASC Finest NGC List

Caldwell	RASC	NGC	Con	Type	Remarks
2	110	40	Cep	PN	
6	89	6543	Dra	PN	Cat's Eye Nebula
7	37	2403	Cam	G-Sc	
10	9	663	Cas	OC	
11	4	7635	Cas	EN	Bubble Nebula
12	108	6946	Cep	G-Sc	
13	8	457	Cas	OC	φ Cas Cluster
14	17	869/884	Per	OC	Double Cluster
15	97	6826	Cyg	PN	Blinking Planetary
18	6	185	Cas	G-E0	
20	100	7000	Cyg	EN	North America Nebula
21	62	4449	CVn	G-Irr	
22	11	7662	And	PN	Blue Snowball
23	12	891	And	G-Sb	
26	61	4244	CVn	G-S	
27	98	6888	Cyg	SNR	Crescent Nebula
29	66	5005	CVn	G-Sb	
30	3	7331	Peg	G-Sb	
32	64	4631	CVn	G-Sc	
33	99b	6992/5	Cyg	SNR	Veil Nebula, east half
34	99a	6960	Cyg	SNR	Veil Nebula, west half
36	71	4559	Com	G-Sc	
38	72	4565	Com	G-Sb	
39	31	2392	Gem	PN	Eskimo Nebula
46	33	2261	Mon	E/RN	Hubble's Variable Nebula
49	32	2237-9	Mon	EN	Rosette Nebula
53	49	3115	Sex	G-E6	Spindle Galaxy
55	1	7009	Aqr	PN	Saturn Nebula
56	15	246	Cet	PN	
59	50	3242	Hya	PN	Ghost of Jupiter
60	74	4039	Crv	G-Sc	See note
61	74	4039	Crv	G-Sp	
63	2	7293	Aqr	PN	Helix Nebula
65	13	253	Scl	G-Scp	Sculptor Galaxy

NOTE: C60 and C61 are listed together as Object 74 in the Finest NGC Objects list. They are two interacting galaxies, known as "The Antennæ", "the Ringtail Galaxies" or "the Rattail Galaxies".

Telescope Making on the Internet

(continued from page 6)

collection. Some of the posted articles are quite good, but one does develop the sense that in order to see the good stuff you have to subscribe, which is not a bad idea, but quite a pricey one from this side of the border.

ATM List Server

If your tastes run more toward the interactive, you might consider joining the ATM list server. This is run by the aforementioned Mel Bartels. As he puts it... "You can join the atm list, a group of people of all levels of expertise, by sending e-mail to majordomo@shore.net and in the body of the message, put 'subscribe atm'. Just introduce yourself and post questions. We all love to help and offer our hard won experiences." Very true. If you do not mind deleting plenty of e-mail on some pretty esoteric topics, this is a very rewarding source of information and assistance—just what the Internet is supposed to offer! ☼

Observing Spiral Structure in Galaxies

(continued from page 7)

observers at star parties. Estimates place M51 at a distance of 35.8 million light-years.

Messier 61

This member of the Virgo Cluster appears considerably smaller than the galaxies previously mentioned, but the spiral arms seem to show detail in moderate-sized amateur telescopes. Certainly this was the case for me in April 1994 on a fairly transparent night when the seeing was excellent. Surrounding the galaxy's intensely bright, non-stellar core were three faint, stubby patches of light. There was fairly good agreement between the drawing I made and a CCD image which I checked later when I returned home. Although the distance to the Virgo Cluster has not been established with any certainty, a distance in excess of 45 million light-years for M61 would seem likely.

There are several other nearby spirals that will show structure in amateur telescopes, including M83, M74, NGC 6946 and NGC 2403. What does your telescope show you? ☼

Oh these mathematicians make me tired! When you ask them to work out a sum they take a piece of paper, cover it with rows of A's, B's, and X's, Y's... scatter a mess of flyspecks over them, and then give you an answer that's all wrong.

*Thomas Alva Edison
American inventor (1847-1931)*

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The 1996 Edmonton General Assembly, Ken Noesgaard, Au6.
The Northern Lights (photo), Douglas Oneschuk, F8.
The Twenty-four Solar Terms of the Chinese Calendar, Henry Lee, O/D4.
Total Lunar Eclipse: April 3rd, 1996, F7.

V

von Braun, Wehner; quote, J2.

New Executive Secretary

(continued from page 3)

projects on which I work each year is the National Hockey League Television Awards show, broadcast in June. This gala fund-raising evening is attended by over 1200 people anxious to meet hockey "stars". I handle the ticket sales and provide front-end customer service for those inquiring about the event.

My background which prepared me for some of the above activities includes a B.A. (University of Guelph), and B.L.Sc. and M.L.Sc. (Library Science), from the University of Toronto. I have continued to take courses over the years, sometimes for employment purposes, e.g. adult education, personnel courses, and, of course computer courses—Accpac, DacEasy, Symphony, Lotus, Word, Excel. Many courses have been taken for fun—how to run a bed and breakfast, understanding investments, learning to speak German, flower arranging, wildflower identification, yoga, aerobics, and volleyball.

I have not always done office work. For the first ten years of my working life I was a librarian with Toronto Public Libraries, specializing in service to teenagers. After getting my M.L.Sc., I spent five years setting up and managing the library service area of the Canadian Centre for Occupational Health and Safety in Hamilton.

My experiences in customer service, office organization, bookkeeping, record-keeping, etc. plus events in my personal life have all played a part in preparing me for running the National Office. Although I have met many RASC members through Starfest, I look forward to meeting many more at the council meetings and the General Assembly as well as speaking with you by phone or e-mail.

I am in the office on Tuesday and Thursday from 9:30 to 5:00 (or later), and on Friday morning, 9:30 to 12:30, and can be reached via:

- Phone: (416) 924-7973
- Fax: (416) 924-2911
- E-mail: rasc@vela.astro.utoronto.ca ☉

Is it not evident in these last hundred years, that more errors of the school have been detected, more useful experiments in philosophy have been made, more noble secrets in optics, medicine, anatomy, astronomy, discovered than in all those credulous and dotting ages, from Aristotle to us? So true it is that nothing spreads more fast than science, when rightly and generally cultivated.

John Dryden

English poet/critic/dramatist (1631-1700)