
NEWSLETTER/BULLETIN

Formerly the National Newsletter

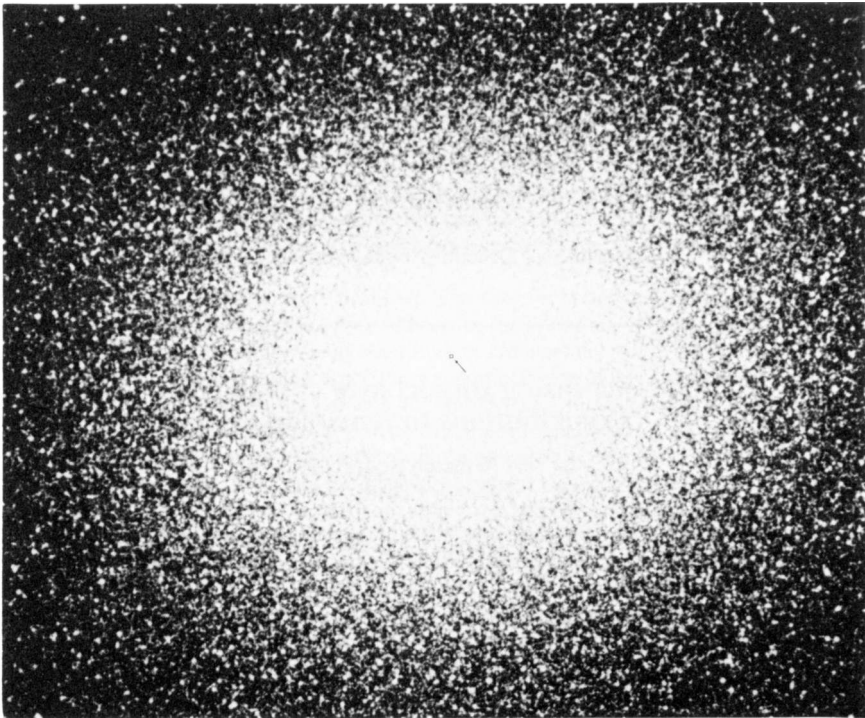
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The Omega Centauri globular star cluster is the brightest of its type in the sky and contains several millions of stars. This photo was obtained with the 1m Schmidt telescope of the European Southern Observatory. The field shown is approximately 1.5 X 1.1 square degrees. The small square near the centre (arrow) indicates the 12 x 12 square arcsecond field shown on page 56. North is up and east to the left. *Courtesy of the European Southern Observatory.*

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The Increasing Importance of Amateur Contributions to Astronomy

by Winston Stairs
Toronto Centre

Recently, I heard the statement made that "there were few areas in which amateurs could make any real contributions to astronomy". It is the writer's opinion that now, more than ever, the opposite is true.

Consider the state to which amateur astronomy has advanced in recent years (optically as well as in radio), and it is difficult to imagine anyone making such claims. If the suggestion is that amateurs cannot match the kinds of results being produced in the world's largest observatories and research labs, then agreement can be met. It has never been the purview of the amateur to conduct research in the areas of astronomy and astrophysics on a level comparable to that of the professional. However, if the suggestion is that amateurs can no longer contribute to the advancement of astronomy – period!, then this is simply a case of misinformed thinking.

Ten to fifteen years ago, an amateur having a telescope of 15cm to 20cm was considered fortunate and obviously someone quite serious about his or her hobby. Today, it is not uncommon to find an amateur observatory housing something in the range of 20cm to

30cm. Even larger instruments can be found in many "club" observatories. A couple of the larger ones known to this writer include the 1.8m reflector currently being built by the San Jose Astronomical Association and a 76.2cm newtonian reflector of the Astronomical Society of Kansas City. Telescopes in this range rival those found in many small colleges and universities and are capable of producing much the same results.

Radio astronomy is another area in which amateurs have made substantial progress. (Note: It was an amateur radio operator by the name of Grote Reber who first mapped the radio sky back in the 1940's). The level of sophistication and expertise shown by amateurs in this area of astronomy is certainly comparable to anything being produced by their optical counterparts.

Amateur involvement in organizations such as the American Association of Variable Star Observers (AAVSO) has for many years assisted professional astronomers in determining such characteristics of variable stars as their period, mass, temperature, luminosity, radius, composition, internal and external structure and evolution to name a few. As of June 1986, the AAVSO had 1,200 (amateur and professional) members worldwide and had gathered over 5,650,000 observations. Amateur involvement in this area of research has progressed beyond the simple observation and recording of magnitude changes by visual methods to detailed studies using advanced techniques in photometry.

Another area in which amateurs have been instrumental over the years is that of public education. This is an area in which amateurs excel. With few exceptions it is the amateur that is best suited for bridging the gap between the professional astronomer and the lay public when examining such things as black holes, galactic dumpiness, supersymmetry and the Grand Unified Theories (GUT), in addition to discussing the more basic questions to do with astronomy. This is an area in which the amateur will continue to play an even greater roll in years to come as astronomers and astrophysicists probe further back in time to the instant of the Big Bang.

An area not yet discussed is that of research funding, or better stated, the increasing lack thereof. As governments continue to cutback in their funding of universities and other research facilities, the activities and contributions from amateurs will necessarily increase in importance. To demonstrate the accuracy and importance of this statement, let me draw the attention of the reader to the Leiden Observatory. This was the center of much research activity (by professionals) until 1980. The Dutch government ceased funding in that year and now the facility and its instruments are run completely by amateurs. There was also speculation some time back that the Royal Greenwich Observatory in England would be shutdown and possibly turned over to amateurs to staff and maintain. I am uncertain as to what the eventual outcome of those will be. One final illustration was reported in the Toronto Star newspaper for April 1, 1989. It was reported that "Federal funding for research at the University of Toronto has started to nose-dive in the last five years ...". It may be argued that this is an oft-heard complaint each year as universities plead their case to the government for continued research funding. However, based on the examples cited above, I would tend to side with the universities on this one.

A problem facing both amateurs and professionals alike is increased light pollution. This has caused the closure or limitation of activities of more than a few professional observatories. The Mount Wilson Observatory which is credited for producing much of our present understanding of the universe was forced to close due to an increase in light pollution from the encroaching city limits of Los Angeles. I understand there was also a problem with funding as well. The David Dunlap Observatory of the University of Toronto in Richmond Hill has been increasingly affected by light pollution in recent years and while it has not as yet been forced to shutdown, it has been limited in the work it can perform. This

unfortunate state of affairs can be expected to continue for some time yet. With increased light pollution and decreased funding, coupled with the largely immobile nature of large observatories, it can be expected there will be even further closings of professional research establishments in the future. This lamentable situation will undoubtedly create unanticipated opportunities for amateurs to improve upon the contributions they make to astronomy.

The amateur is by nature more mobile in setting up and observing than his or her professional counterpart. The amateur therefore is able to transport his or her equipment more readily and take advantage of those areas largely unaffected by light pollution. With the advances in recent years in computer technology and high power portable telescopes utilizing folding optics and image intensifiers or CCD's, the role of the amateur has changed from that of someone simply interested in viewing an object and taking pretty pictures, to someone able to make real discoveries and contributions to astronomy. This has always been the case to some degree and there are those still who are simply interested in taking in the wonders of the universe (myself included). However, with the technology now available at somewhat reasonable cost, more and more amateurs are getting serious about their work and making discoveries of a nature that was once only thought possible through the use of the world's largest telescopes.

In concluding, it is the expressed belief of this writer that the future looks bright for amateur astronomy, with even greater opportunity for involvement and contributions to be made on the part of every observer.

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Astronomy Day Report (1) **May 13, 1989**

by Mario Caluori
Montreal Centre

For Astronomy Day the Montreal Centre put on an Open House at the centre's Observatory. The general idea was to display our facilities to Montrealers in the hope of attracting new members and showing them what amateur astronomers can really do. Our own members, some of whom came with relatives and friends, were overjoyed to see the main room and basement after their recent renovation.

The weather plays a key role in the success of such an event, especially when demonstrations were planned for both the daytime and evening. Montreal had a little of everything that day including some hazy skies and thundershowers. Louis Bernstein, the organizer of our event, manned our Celestron-8 telescope. It was equipped with a solar filter and Hydrogen Alpha filter. Bert Widdop brought along the Charles Good telescope that he

just recently refurbished and demonstrated how to go about making drawings of sunspots using the projection method. Khurram Syed (author of *Daytime Astronomy Through Sidereal Telescope Alignment*) was on hand, but due to the fact the skies were so very hazy, he felt that the planets and other interesting objects just would not be visible.

Inside the observatory there was activity on all three floors. In the basement, visitors were shown a part of our collection of antique refractors, and were given some theory about basic telescope design. A slide show made by the grade 5 students of our Centre secretary Maritza Berger was available for kids to watch, as well as a tour of the darkroom and workshop areas.

The main floor was the busiest of all. Here, members answered questions, handed out literature, and sold our own publications. A local astronomy store, La Maison de L'astronomie, provided an interesting display of high-tech telescopes and accessories. Another store, Harrisons, provided dazzling new astronomical posters.

A showing of a National Film Board of Canada film about the universe was set up in one corner, and an automated projector showing the solar system in another. Every square centimetre of floor space was used. However, what I believe impressed most people was on the top floor – our Celestron-14 telescope mounted in the dome.

Approximately 100 people, and one television station visited our observatory, the bulk of whom came in the mid-afternoon. The Centre showed it had a lot to offer as evidenced by our displays, and I am certain our visitors were surprised to learn that such an outfit really existed right here in Montreal. Due to our hard-to-find location on the grounds of McGill University and the fact that we do not have a street address, it is no wonder we have been called “the best kept secret!”

Such an Open House as the one we put on goes far towards solving this problem, particularly if a program is done consistently.

Astronomy Day Report (2) **March 13, 1989**

by Paul Fjeld
Toronto Centre

The Toronto Centre's Astronomy Day activities were kicked off on Saturday, May 13 by a beautiful sun with plenty of sunspots. The evening which followed was, for the most part, cold, windy and cloudy except for a bit of clear sky over the Morningside Park location.

This most extensive Astronomy Day was spread over more than one site and John Ginder deserves much credit for how well organized everything was. Also, the special logo and name tags were great.

Tom Quigley and Randy Attwood got things going at the McLaughlin Planetarium site and thanks go to the Planetarium for letting us use their front “lawn”. It is a nice trap for people coming and going from the Royal Ontario Museum. Two Questar telescopes belonging to Mary Anne Harrington and the Centre itself, Randy's Celestron-8, and Tom's 10-inch Meade provided the lure. It seemed odd to some of the passersby that telescopes would be set up at any time other than at night.

I personally was prepared to answer these kind of questions:

What are you looking at?

“The sun.”

“What are those spots on the sun?”

“Sunspots.”

Reality was different, and the barrage of questions that were asked could be all answered by at least one of the members helping out. It was nice to see the amazed reactions from some people when they found out that the spots they were looking at were huge disruptions on the sun's surface. Sometimes they were looking at a dust speck on the filter but the effect was the same. Perhaps a new member.

The really big display was on the lower level of the Ontario Science Centre. More than ten telescopes were set up in the bright courtyard among the trees while a nice demonstration of telescope making occupied the glassed-in corridor nearby. In the morning, Sara Seager and Lisa Truant manned a couple of telescopes at the entrance of the Science Centre and directed those interested to the main show. Cathy McWatters performed a neat balloon trick in the morning and afternoon. Blow up a dark balloon inside a clear one, shine unfiltered sunlight through the telescope on them and see which one survives. A number of children had clear (intact) balloon souvenirs with a dead (dark) balloon inside.

Ralph Chou, Michael Daly, Ivan Gareau, Karl Miller and David Mills Jr. all brought their Schmidt-Cassegrains to take a peak at the sun. Bob May's refractor provided a really clear view and places near a sun spot group at the limb could be identified. It appeared three-dimensional. Alan Proctor attached his Daystar Hydrogen Alpha filter to his telescope so that people could have some idea of what was really going on in the sun's chromosphere. Once your eyes were adapted to the dim view, with the aid of a black fur eye shield, you could make out the red mottled surface seething with ... stuff. It was too bad that the two TV crews present could not pick up the action through the viewfinder. We made it on the airwaves anyway.

John Ginder demonstrated what could be done with different lengths of plumbing pipe and a few cheap lenses. If only Galileo had had a bit of plastic tubing and a couple of magnifying glasses (or perhaps a second-hand photocopier double lens a little earlier in his career.

David Aylsworth organised the indoor display which featured two mirror grinding stands. Visitors were invited to do a little grinding and to see a finished result with a 1/20th wave mirror, lent by Jack Winzer, and a complete homemade telescope. Jack gets special thanks, as well, for donating many of the supplies. Also on display was a good little library of astronomy books, overseen by Darnley Wright, and the Toronto Centre's public education panels. Ted Molczan showed off some very different aspects of observing earth satellites and had prepared a list of targets to look for in the evening. He even had his computer there, set up to run the fabulous PREDICT program he has written (and is still writing).

Ivan Semeniuk, the Ontario Science Centre's staff astronomer, was very helpful and deserves many thanks. At the end of the day, everything was packed up and evening plans for the two park sites (Centennial Park and Morningside Park), York University and the University of Toronto sites were finalized. A bit of dinner, a check of the tan (at least one member was tanned on one side of the face!), or a look at the sky around sunset was enough to convince some members that the day would not end perfectly.

Centennial Park in the west end of the city was clouded out but Randy Attwood and Tom Quigley stayed in case anyone was curious what the Astronomy Day signs were about. At Morningside Park in the east end, Steven Spinney and a number of members found a few things at which to point the telescopes. The moon and Jupiter, as seen through scattered clouds, drew most interest. Frank Dempsey, among others, tried to spot at least one satellite through the murk – without success.

Both the University of Toronto and York University had planned open house activities to support Astronomy Day. Paul Delaney supervised at the York Observatory and Dieter

Bruckner had University of Toronto students demonstrating some of their incredible equipment. RASC members at the University of Toronto were essentially clouded out, but late in the evening, the moon briefly appeared. Through another break in the clouds, one observing success was finally tallied from the deck on the 14th floor of the Burton Tower. Irene Wilk spotted the Landsat 4 satellite zooming overhead. She didn't even use Ted's satellite tables.

Reprinted from Toronto Centre's *Scope*

Natural Light Pollution The March Aurora Display

**by Steven Spinney
Toronto Centre**

On the evening of Sunday, March 12, North America was subjected to a display of the aurora borealis, or as it is commonly known the Northern Lights.

I received a call from Ted Molezan around 10:45pm telling me to go outside and watch the show. It was a toss up between watching the end of a Rambo movie or the aurora so I went outside expecting to see a few sheets or rays of white aurora. Much to my surprise and pleasure, the whole northern sky was ablaze with light and colour, even with a first quarter moon setting in the west, there was a shimmering mass of light extending from east to west over 120 degrees of sky from the northern horizon.

I quickly went inside to get my camera and a tripod to try to capture some of the display. After a long search, I was able to find some Fuji P1600D (ASA 1600) slide film and I loaded it up. Under normal Toronto skies in my backyard, I am able to take exposures up to 40 seconds with a 50mm lens and an aperture of f2.8 without worrying about sky fog. I started to shot exposures of 10, 20, 30, 40, up to 60 seconds knowing that I might get some trailing with the stars but was mainly interested in the aurora. The spikes and sheets changed from minute to minute and I could not believe what I was seeing. I took some pictures of Leo that showed red extending well below the constellation.

When I got my slides back I was in for a surprise. Most of the shots were over-exposed! The aurora was so bright that the best results were obtained using the ten second exposure time. I was able to improve some of the shots by slide copying and obtained several shots that I was happy with. I learned that you should not take anything for granted and I will bracket my shots more in the future.

I don't expect to see an aurora display like that one for a long time to come. Wait a minute! The sun's activity isn't at maximum yet! Maybe?

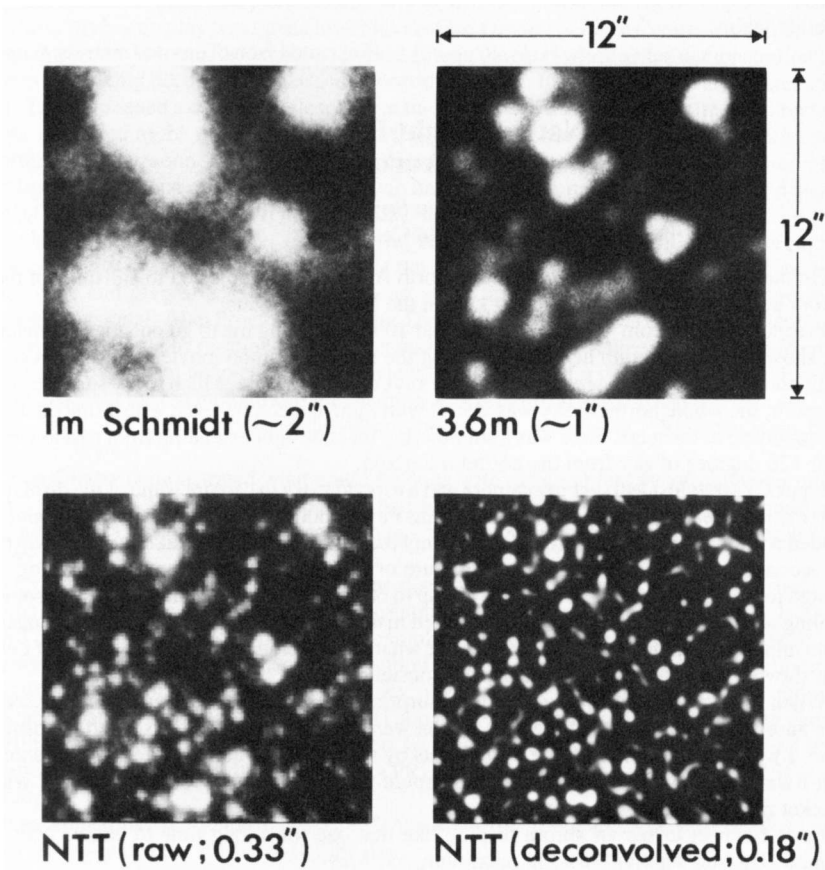
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“First Light” for NTT

by Ian McGregor

The most technologically advanced telescope in the world obtained its “first light” image on March 23, 1989 when the New Technology Telescope (NTT) of the European Southern Observatory at La Silla Observatory in Chile began operational use. The performance of the NTT easily surpasses in optical quality all other telescopes ever built with the possible exception of the 2.4m Hubble Space Telescope to be launched in 1990.

Field Near Centre of Omega Centauri



Upper left: Enlargement of a plate obtained in 1984 with the ESO Schmidt telescope under mediocre seeing conditions by La Silla standards (about two arcsec).

Upper right: An excellent photographic plate obtained with the ESO 3.6 m telescope in 1977. Seeing about one arcsec.

Lower left: A 10 sec unfiltered CCD exposure made with the Nfl at the moment of "First Light" on March 23, 1989. Seeing is about 0.33 arcsec.

Lower right: The same frame is shown after "sharpening" by advanced image processing. Seeing is about 0.18 arcsec.

The 3.58 m primary mirror of the NTT represents a revolution in telescope technology as it uses Active Optics to provide high quality images. The thickness of the primary mirror is only 24cm which allows high flexibility and its form can be controlled by computer activated supports. As the alignment and focussing of the secondary mirror are also computer controlled, the telescope is always in optimal shape for the best images possible. This is the first time that the concept of Active Optics has been used on a real telescope.

The quality of images produced is shown by examining the cover photo of Omega Centauri with the NTT field indicated and the accompanying four images. All photos are courtesy of the European Southern Observatory.

The improvement in resolution is dramatic, as illustrated for instance by the triple star, just to the right of the field centre. As well, the 10 sec NTT exposure reaches about magnitude 20. With a reasonable exposure time, a limiting magnitude well beyond magnitude 27 may be reached.

Experience gained with the NTT will help with the design and construction of the 16m Very Large Telescope (VLT) expected to be completed in 1994-1995. See "A European Telescope for 2001" in the August 1988 issue of the *National Newsletter*.

The Saguaro Astronomy Club Database

by Alister Ling

How would you like to have an extensive database of over 10,000 deep-sky objects for free? Members of the Saguaro Astronomy Club of Arizona have input the entire NGC (New General Catalogue), the Sky Catalogue 2000.0, and other works into a massive database. They did it for their own use, but now want to share it with the amateur community so that others may enjoy the sky as much as they do.

Only non-stellar deep-sky objects are included; that is there are no double or variable stars. Among the database fields are: name, common name, type, constellation, Right Ascension, Declination, size, magnitude, magnitude of central star or brightest star, number of stars (if it is an open cluster), Uranometria chart number, Tirion chart number, abbreviated description, and special notes.

In addition, there are separate files full of information: 600 colour contrasting and easily resolved double stars; Jim Lucyk's index of photographs from books and publications; 70 stars for calibrating setting circles; a potpourri of references on white dwarfs, red stars, proper motion, etc.

The only catch: it requires over 4 Megabytes of memory on a hard disk. Included with the database is a program which generates observing reports or lists based on any of the objects' attributes. Information retrieval can be made more efficient if the user has one of the popular database manager programs.

Steve Coe of the Saguaro Astronomy Club has asked me to be the Canadian distributor of the database, so that I can distribute it "freely" for the cost of the disks, packaging, and postage. The idea behind having a Canadian distributor is to dispense with the frustration of monetary exchange and cross-border mailings. At this point I can only distribute the 5.25" DOS copy, but Steve is looking for someone who is willing to do the distribution of the MAC version.

If you would like a copy, send a cheque for \$3.00 to: Alister Ling, 310-1017 Seneca Avenue, Mississauga, Ontario L5G 3X5. This covers postage and two floppy disks. Those who prefer to send their own disks please do so, just include enough stamps for return postage. If you are willing to undertake distributing a MAC format of the SAC database, please contact: Steve Coe, 5942 Loma Lane, Glendale, Arizona USA 85302.

Observing Earth Satellites

by **Ted Molczan**
Toronto Centre

Many of us are old enough to remember going out on the porch to look for Sputnik 1 when it passed overhead in the fall of 1957. In fact, Sputnik was too small to be seen with the naked eye and what most people saw was its large booster rocket which had also gone into orbit. Satellite launches were big news in the late fifties and early sixties. Satellites were not easy to launch and many ended up in spectacular fireballs on or near the launch pad. Today a satellite is launched every three or four days and most are not considered newsworthy except on the rare occasion that one blows up.

In the early days of satellites, amateur and professional astronomers were enlisted to help keep track of the few objects in orbit. Thousands of amateurs, including many RASC members, contributed observations to the Smithsonian Astrophysical Observatory's Project Moonwatch. Their observations were valuable to geophysicists who studied small changes in their orbits to learn about the density of the upper atmosphere and the shape of the Earth. Moonwatch ended about fifteen years ago and today NORAD tracks the nearly 7,000 objects in orbit using a global network of radar and optical sensors.

Today, for the most part, astronomers ignore satellites except when one ruins a scientist's valuable photographic plate or an amateur's painstakingly guided exposure of Eta Carinae. I have not been present on such an occasion to hear their reaction, however I am certain that they could not be quoted here. As with most of mankind's inventions, satellites have quickly gone the route from "eighth wonder of the world" to commonplace and an occasional nuisance. So, one might ask: "Why bother to observe satellites, let alone write a column about them?"

I find in satellites the same appealing features that I find in traditional areas of astronomy. The observational challenges involved in spotting a specific faint satellite are as great as those involved in finding a distant galaxy. Also, satellites move at speeds up to several degrees per second across the sky! The traditional "star hopping" technique used to locate deep sky objects is used to find shallow sky objects (satellites). So, if you plan to get involved with satellites you will need to learn the sky (ie. the constellations) and the use of a star atlas.

Although they are artificial, satellites obey the same natural laws as traditional objects studied by astronomers. If the orbital motion of the planets, asteroids, comets and binary stars are of interest to you, then you will be right at home with artificial satellites.

Astronomers study the sun because it is the closest star and leads to a better understanding of all stars. Also periodic changes in the sun's activity have a profound effect on the nearby earth environment. For example, the northern lights are visible manifestations of the effect of solar storms on the earth's upper atmosphere. By observing the great increase in the rate of orbital decay of satellites, it was discovered that these same storms also cause the density of the upper atmosphere to increase manyfold.

One of the great attractions of astronomy is that it encourages many of us to develop additional interests and skills, such as photography and dark-room methods, optics, mathematics, physics, navigation, computer programming and electronics. Satellites offer challenges in each of these fields.

I believe that I have made a case that the study of satellites is compatible with the traditional areas of study in astronomy. Astronomy offers a variety of learning opportunities, and satellites add to that variety.

Whether or not you decide to take up satellite observing in a serious way, you may find it

enjoyable to do casually. In fact, you can “satellite gaze” at the same time that you “stargaze”. So here are some tips on how to spot satellites with the naked eye.

There are about 300 satellites that are large enough and low enough to be seen with the naked eye. Most of these are a little less bright than the stars in the Big Dipper. The average naked eye satellite is about three or four metres across and orbits less than 1000 km above the earth’s surface. They are visible because they reflect sunlight just like the moon and planets. The best time to see them is during the first hour or two after the sky becomes dark after sunset or during the same period before dawn. At those times the sky is dark enough to see satellites and the earth’s shadow is low enough so that the satellites are in sunlight.

If you are observing in the evening then you should look for satellites in the eastern half of the sky. It is difficult to see all but the largest satellites in the west because they are between you and the recently set sun, so you are looking at their dark side. It is exactly the same phenomenon as the phases of the moon. In the morning, observe in the west because satellites will then be between you and the sun.

Most satellites will move roughly north to south or south to north. Some will move west to east. If you think that you spotted a satellite moving from east to west it is probably an airplane. Only a few satellites have been launched in a westerly direction. The easterly direction is preferred because satellites receive a boost from the earth’s rotation at launch, which reduces the need for rocket propellant.

Most satellites shine with a fairly steady light except for a gradual change which occurs when their phase changes as they move across the sky. Some satellites tumble end over end and their brightness may vary over a period of less than one second. In the evening you will often see a satellite fade out over a period of less than ten seconds. This is the satellite’s entry into the earth’s shadow.

On a typical night it is easy to spot ten satellites per hour. Twenty per hour can be spotted with a little effort and a little luck. Have fun.

Reprinted from Toronto Centre’s *Scope*

Events Calendar

August 25–26

Starfest '89, Mount Forest, Ontario. Hosted by the North York Astronomical Society.

Contact Andreas Gada (416) 761-1798. See ad in June issue.

August 25–28

Nova East '89, Fundy National Park, New Brunswick. Sponsored by the Halifax Centre RASC. Contact Doug Pitcairn (902) 463-7196.

August 30–September 3

6th Annual Mount Kobau Star Party, Mount Kobau, British Columbia. Hosted by the Okanagan Astronomical Society. Contact Peter Kuzel (604) 545-1226.

October 13–14

1989 Kingston Meeting, Dominion Astrophysical Observatory, Victoria, British Columbia. Annual gathering of theoretical astronomers. Topic: *The Age and Evolution of the Galactic Disk and Halo*. Contact Chris Aikman, DAO, 5071 West Saanich Road, R.R. #5, Victoria, B.C. V8X 4M6.

Observer's Cage

by David H. Levy

We all measure the seasons on the Earth by the changes they bring. In Canada, these changes are so dramatic that one cannot avoid them. In Arizona, there are really only two seasons, hot, and not-so-hot.

Stargazers have a different way of looking at the seasons for the sky offers four quite distinct concentrations of objects to observe. Of course, the members of our solar system come around at any time, belaying our attempts to divide a year into four, but for the more distant aspects of the sky, each season has its specialty.

Spring is galaxy time. There are clusters of galaxies stretching from Ursa Major to Coma Berenices and from Leo to Virgo. Faint galaxies abound in Hydra. During the last two weeks of March you can, with planning and luck, observe all the Messier objects in one night (although missing M30 in the morning or M74 in the evening is very possible). There are examples of all kinds of galaxies including spirals (M65 and M66), barred spirals (M91), ellipticals (M87), and irregulars (Leo I, M82). In fact, place your telescope in the middle of the Coma-Virgo cluster, and you can count galaxies as you move from field to field.

In summer, our own Milky Way arches high above us, enabling us to come home to see what is in our galaxy. The Milky Way has examples of double stars (Beta Cygni) and diffuse and planetary nebulae (M8, M57) as well as a host of globular clusters (M13, M22) that are well placed now for observation.

The other half of the year is not quite so well defined. I like to think of autumn as a time to get acquainted with variable stars. Mira, the prototype of all the variable stars of long-period is well placed in Cetus, and Delta Cephei, the type-star of the Cepheid variables, is very easy to observe. Nearby is Mu Cephei, a very red variable of irregular period that is easily visible through binoculars.

What about winter? Definitely this is the time we remember nebulae and clusters. Almost every winter night begins with M42 in Orion but we also like to observe the Crab Nebula in Taurus, Hubble's Variable Nebula in Monoceros, and the Clown-Face, or Eskimo Nebula in Gemini which blinks on and off as we shift our concentration from nebula to central star. There are star clusters like the Pleiades, the Hyades, M34 and M52. In Auriga, M36, M37 and M38 are popular, as well as M46 in Puppis, and of course, the exquisite cluster-nebula combination of the Rosette in Monoceros that combines what is best about the winter sky.

We are not limited to galaxies in spring, the Milky Way in summer, variables in autumn, and nebulae and clusters in winter. Nor are the Earth's seasons mutually exclusive. In both cases, however, a season's peculiar highlights make it something to remember.

Archeo ATM

by Howard Spragins
Edmonton Centre

There was once a time when "amateur telescope maker" referred to individuals who spent years grinding and polishing a 6-inch f/8 newtonian telescope mirror for their first telescope. Now, one has only to look through any of the popular amateur astronomy magazines, including those devoted to telescope making, to see that mirror making is a dying art best left to those who make their living from the production of optics.

There are very few kits available for making mirrors, and though it is certainly possible to find them, or simply mirror blanks to be purchased separately from the grinding materials, the availability is not what it was in the past. I believe this indicates that today's amateur telescope maker has lost interest in mirror making. It is a time consuming process, requires great patience on both the part of the mirror maker and that of his or her spouse, requires at least a little bit of equipment and offers results that may or may not be an improvement over commercial grade optics.

Today's amateur telescope maker is a different breed of individual. Time is now a greater priority, and an ATM is far more inclined to save the money for a commercial mirror even if they are building the remainder of the telescope, despite the fact that most manufacturers are indicating that delivery may be in excess of one year, particularly for large aperture mirrors. It is more preferable for today's ATM to spend that year completing the tube assembly and mounting for that telescope.

A number of years ago, in fact quite a few, I, too, was part of the old school of amateur telescope making. I purchased a 6-inch mirror kit with the intention of producing my own mirror. With considerable enthusiasm, I ground and semi-polished a deep curve in the mirror but then set aside the project for more pressing teenage priorities.

Having recently sold my business, I found myself with an excess of time (and energy) that prompted me, with the help of Peter Ceravolo and the equipment in his shop at work, to once again pursue the art of telescope making. I would pick up where I left off so many years ago and complete the mirror I had started.

It did not take long to determine that more work was going to be needed than I had originally thought. I assumed that since I had "polished" the mirror it required only parabolizing. Such was not the case. The mirror, though having the appearance of a finish, was really a long way from having a nice, clear surface. In addition, instead of $f/4$ as I had first intended, the curve was $f/3$, making it virtually imperative to regrind the mirror. This did not pose a problem as I had nothing but time on my hands.

The first grains of #120 Carborundum grit scratching away my hours of hard work presented some moments of anxiety, but it was short-lived, as I found regeneration of the curve a fast process. It took only a matter of hours at each stage of generating the curve and grinding with successively finer grades of Carborundum. At the conclusion of grinding with each grade of Carborundum, the mirror was subjected to rigorous inspection under high magnification to determine that all the tiny pits had been eliminated. I was surprised at the speed and ease with which I progressed. In fact, I had visions of grinding a large aperture mirror since this one seemed so easy! In a matter of about two weeks of part-time work, I had the mirror ready for polishing.

The polishing stage involved making a pitch polishing tool in which pitch was heated and shaped to match the mirror's curve and then channels were cut to allow the semi-rigid pitch to "flow". The actual process of polishing seemed to take as long as the grinding. In a short time, glass at the centre of the mirror took on a clear sheen, but to extend that clear sheen to the edge of the mirror was a very lengthy process. Even when the mirror had the appearance of being clear, scrutiny under magnification showed that the surface still had a frosty appearance.

Parabolizing involved producing a pitch lap not dissimilar to that of a polishing lap except that the channels were cut deliberately to remove glass from the centre of the mirror at a faster rate than at the edge, thus achieving the desired figure. Peter Ceravolo explained that this is where the boundaries between science and art are ill-defined, as generating the figure involved a certain degree of skill and luck. With each mirror, luck is less a factor, though still important as to when the mirror will be finished.

The process turned out to be time consuming, and at times frustrating. To see so much progress so fast and then to be slowed to a snail's pace seemed cruel and unfair at this stage of the game. It had been said that parabolizing could take anywhere from half an hour to an infinite number of hours, depending upon which proportion of luck I possessed. I had visions of having the mirror finished shortly after the polishing stage but such was not the case.

The parabolizing process stretched out over a number of hours. Though at times it appeared as though progress was being made, at other times it seemed like I would never be finished. Three different pitch laps were used in an attempt to find the right one. The first two were strictly parabolizing laps, and the third was a polishing lap used to correct a severely turned edge, which means the edge of the mirror focused to a different point than the centre of the mirror. It was with that third lap that I would find my degree of luck.

After spending a couple of hours at the mirror polishing in an attempt to solve the turned edge problem, I was resolved to start again at square one of the parabolizing stage. However, with the mirror under the Ronchi test, it seemed as if my work was virtually complete. I had by accident a good smooth surface with a slightly under corrected parabola that Peter described as at least comparable to commercial optics and probably better than in most cases. The figure showed to be better than 1/8th wave. My dilemma now was do I attempt to correct the figure to make it better, or accept it as 1/8th wave? My first inclination was to attempt the correction, but given the potential time involved in "correcting my corrections", I decided to be satisfied with the mirror. Besides, observing in the cooler temperatures of Alberta would make the mirror contract and probably improve the figure, though it is unlikely I would be able to distinguish the difference.

Having now been through all the stages of starting and stopping and now completing a mirror, I would say that I am thankful to have had the experience. Few members of this generation of ATM's can have the pleasure of saying they finished their telescope from scratch. Having the help of an experienced optician with precision test devices out of reach of the home builder at my disposal certainly was an asset, especially as, towards the end, I had every move scrutinized. Without that help I would not have produced the mirror that I did.

The mirror took about ten weeks, working on and off, to complete. I could certainly have completed the project sooner had I been working in my home, but the finished product would not have been the same. Given the opportunity now, I would have to think long and hard about attempting a large aperture mirror.

I still have the desire to own something on the order of sixteen to twenty inches, but in the mean time, I will get the most out of what I have.

Reprinted from Edmonton Centre's *Stardust*

The Maple Grove Astronomy Club

**by Robert MacConnell
Club Supervisor
Maple Grove Educational Centre**

The Maple Grove Astronomy Club was formed in 1987 in Hebron, Nova Scotia under the direction of science/mathematics teacher Robert MacConnell. It was as started when a provincial grant was given to Mr. MacConnell for the purchase of a suitable observing

telescope. The instrument chosen was an 8-inch catadioptric design with an equatorial mount. In its first year, the club built and assembled a handsome 10-inch reflector which is presently used for loans to members.

During the year 1988–89, the club held observing sessions at the Maple Grove Educational Centre's playing field, and at Robert MacConnell's home during the winter months. Once a month meetings are held after school hours to familiarize members with upcoming celestial events, observing tips, computer work, films and videos.

Last autumn the club was honoured to aid in organizing a talk and observing session with Dr. Roy Bishop, physics professor at Acadia University and editor of the RASC *Observer's Handbook*. As well, members visited Digby surgeon, Dr. Bill Thurlow, an avid astronomer and proud owner of a 12.5-inch telescope.

This spring two main events were planned. One was a talk by Harry Taylor, a retired NASA space scientist on The Exploration of Venus which we are co-hosting. The other was a club visit to the Halifax Centre RASC who are putting on an Astronomy Weekend for us with visits to the Nova Scotia Museum's Planetarium and St. Mary's Observatory. This would highlight the year for these young and enthusiastic amateur observers.

We are currently building three rich-field refractor telescopes for the club members to loan and in August the club will attend Nova East '89, the eastern Canada observers camping weekend in Fundy National Park, New Brunswick.

Writing For Your Newsletter

by Alister Ling
Edmonton Centre

Having been both a writer and an editor for an amateur astronomy newsletter, I can certainly appreciate living on both sides. Even at the best of times, I still have to "twist arms" to fill out a few issues. There really should be no need for this in a society like ours. Whether you are experienced amateur astronomer, or just starting out, you have some valuable insight to share with others that only your point of view can provide.

In my view, the purpose of amateur astronomy is to share our wonder and discovery of the universe with others. Over the past few years, I have corresponded with various amateurs across the globe. Through many of them I learned techniques, equipment joys (and problems), and the whereabouts of exotic objects. Of course, I enjoy sharing techniques and thoughts with less experienced amateurs. After all, soon they will be at my level and the interchanges of observations become a wonderful way to spend time during cloudy nights.

What to share? Many members simply do not know what to write about. The number of topics to choose from is basically limitless. The method I use for ideas is to let them come to me. I might see something while observing, or have an interesting thought pass by while I am driving to a dark site, or flipping through a reference book.

Basically, anything that catches one's fancy is a prime target for an article (remember, the RASC is devoted to the allied sciences too). Did you see a fascinating sunset, or an atmospheric phenomena you did not understand? Tell us about it, and someone in the RASC with an interest in the topic will almost be sure to respond! Reports on field trips, assemblies, and star parties are good places to start your writing life. Humour always goes over well, there is nothing worse than totally deadpan observing buddies.

Editors are usually looking for short pieces to fill up space left over near the back of a newsletter. It is easy to write one of these: two sentences can serve as an introduction, four

more as the main body of your “observation”, and throw on a couple more sentences to conclude. Before you know it, that’s half a page! Mark Zalcik of Edmonton has become quite prolific writing these “ditties” on a veritable smorgasbord of topics, ranging from auroral sightings while on an outside security tour, through watching the full moon’s image distorting in skyscraper windows, to eating chocolate icing as observing “food.”

A number of people are quite shy about sending in material to their newsletter. If you are worried about your poor grammar or spelling since you haven’t written anything since high school, don’t worry, that’s what editors are for! On the other hand, if you really don’t want to see your writing torn apart by an inexperienced editor, simply attach a note on the front in big friendly letters “Please do not touch the wording or I will never submit anything again. Believe me, threatening not to write works wonders. One more thing, there is always someone out there with less knowledge than you, so never feel as if you have nothing to contribute.

As I mentioned earlier, amateur astronomy depends on sharing. While this is a rather altruistic motive, there are others. As a very young (and vain) writer, I was rather proud of seeing my name in print and to think that my words had weight. Soon, I realised that I could contribute real information to other amateur’s observations, and this process of exchange proved to be the driving force behind my scribbling. These days, I am quite happy to note that my article writing for *Deep Sky* and *Astronomy* magazines more than supports my subscriptions to various publications.

Allow me to move off on a tangent to tell a story. A friend of mine was considering dropping his subscription to *Deep Sky* magazine because he felt that many articles were too superficial with their observations, and the topics did not often coincide with his interests. My reply to his complaint was that he had better start writing for them! He has an experience level the equal of and higher than many contributors, so the only way of seeing good articles in the magazine was to write them himself. This also applies to Centre newsletters.

A newsletter with a variety of editors makes interesting reading. Hopefully, you will want to be a part of it. Your readers are out there waiting to read your thoughts, Please share.