

AURORA



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The Royal Astronomical Society of Canada - Windsor Centre

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An Odd Adventure in Mirror Making by Randy Groundwater

I have never thought of myself as a superstitious person, nor do I think I will ever find myself wondering about how many angels can dance on the head of a pin. But a strange thing happened recently that gave me pause to wonder.

It was on a February afternoon earlier this year when a total stranger contacted me, quite out of the blue. He said that he remembered the monthly astronomy newspaper articles I'd once written and that he was cleaning out his garage and wanted to give me a box of his dad's old astronomy stuff that had been lying around there since his death nearly fifty years ago; otherwise it was going to the landfill with some other junk. What he described sounded like some supplies from a mirror making project his dad had once tried.

My curiosity was piqued and following his directions, took a trip out to a rural county road to the address I'd been given. At the end of the long, gravel drive I was greeted by the man I'd talked with on the phone. He was standing in front of an old garage located at the rear of the house. We chatted for a few minutes during which I learned that he and his wife had lived there since 1973. He remembered back to when his father had been working hard on grinding a mirror for a telescope project in the late 1960s, but had to stop when he took sick and eventually died.

We then walked towards the open garage door where he showed me, amongst the sundry junk collected within, an old cardboard box which indeed contained what he'd described: a fairly finely-ground 10" diameter pyrex blank and plate glass grinding tool, a selection of abrasives in cardboard containers, a rubber pitch lap mat, a couple of very worn, musty old classic amateur telescope making books (both of which I already have) and, wonder of wonders, a meticulously crafted, homemade Foucault testing device in perfectly preserved condition. I was amazed.

To top it all off, in the bottom of the box was a little black notebook which contained his father's detailed handwritten notes recording his many hours of effort put into the unfinished project. I glanced through his entries which as it turned out were all from April of 1968. One entry immediately jumped out at me – a notation of a radius of curvature measured at 160".

So this was indeed an unfinished, 10" f/8 project that had lay untouched for nearly half a century.

He then rifled amongst the other junk and carried over one additional item surviving from his father's ill-fated ATM project. It was a grinding stand that had been put together from plywood and 2x4s. Even the cleats to hold the grinding tool were still attached.

I offered to pay him what I thought was a reasonable price for the items as they were, but he would have none of it, and wished me well. So after we put the box and grinding stand into my van we said our farewells and I left for home. What a strange feeling it was, having had all of this suddenly placed in my hands, reviving once again a long-ago enthusiasm for mirror making. Not since the early 1970s had I tried my hand at this, what was once a rite of passage as an amateur astronomer, when I'd successfully made a 6" f/4.2 mirror, and assisted on a number of similar projects undertaken by others.

Back home, I set to work rehabilitating what I'd been given. The abrasives were discarded as they'd all been opened so I had no way of verifying their purity. The 1 3/4" thick pyrex blank – heavy by today's standards – was in near-perfect condition; with a good bevel and only a very small, barely noticeable rupture along the circumference just beneath and not affecting the front surface. The face as mentioned appeared as though it had reached the stages of fine grinding; though the black, rubber lap mat had apparently been laying on it for a very long time, causing a clear imprint all over the smoothly ground glass. Viewed at a sharp angle, a gentle curve could be seen.

Aside from a small chip protruding just slightly into the grinding surface, the much thinner, plate glass tool was also in very usable condition.

One of the books in the bottom of the box was the classic, "Making Your Own Telescope" by Allyn J. Thompson. It was stamped inside its cover as coming from the old astronomy company, Optica b/c. A little business card sized calendar, listing some astronomical events of 1968 and produced by Optica b/c, fell out from between the pages. Taking out an early 1970s copy of Sky and Telescope from my collection, I found one of their ads for what I believe to be the same, honeycomb-channeled lap mat that I had inherited. This all but confirmed my suspicion that Optica b/c is probably the company where all the supplies had come from.

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Calendar of Events

Our next meeting...

Tuesday November 15, 2016

7:30 p.m.

at

[Ojibway Park Nature Centre](#)

5200 Matchette Road

Main Speaker...

Steve Pellarin

Topic...

"New Horizons at Pluto"

Activities...

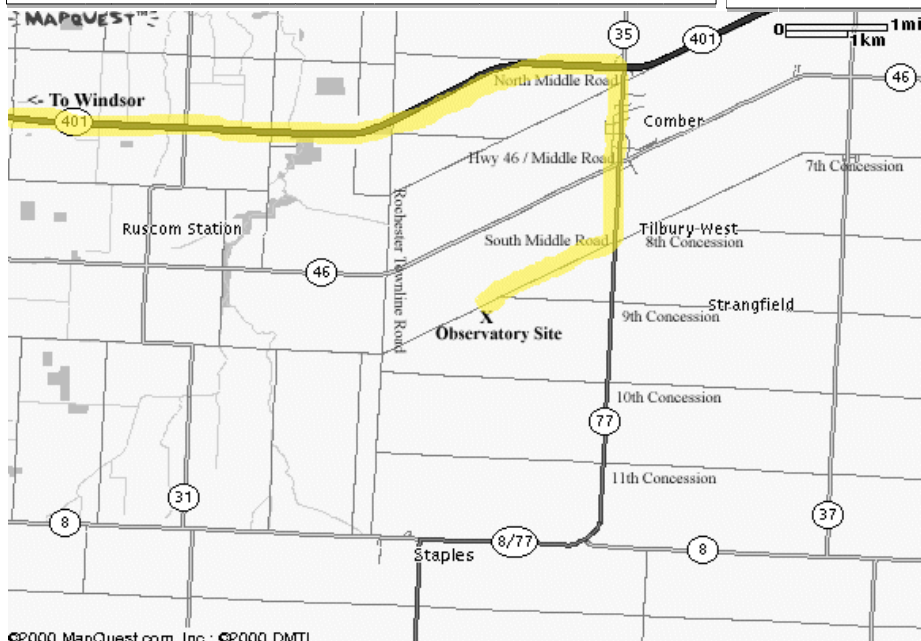
Orionid Meteor Shower: Peak on the night of Friday October 21st but the light of a waning gibbous moon interferes most of the night.

Moon, Venus and Saturn: Form a nice grouping low in the southwest sky shortly after sunset on the evening of Wednesday November 2nd.

Open House Night at Hallam: The next open house night at Hallam is on Saturday November 5th at 7:00 p.m..

Daylight Savings Time: Ends at 2:00 a.m. on Sunday November 6th. Set your clock back 1 hour.

Leonid Meteor Shower: Peak on the night of Wednesday November 16th however the moon will interfere until midnight so view will be best in the early morning hours of the



Hallam Observatory Site

Directions: The map at left shows the Comber area and it includes the major highways (401, 77, 8 and 46) that are in the area of the observatory.

The most direct route from Windsor is "highlighted" on the map which is to take Highway 401 East to Highway 77 South to South Middle Road. Turn right onto South Middle Road and go about 1 kilometer and just after the point where Concession 9 joins it (it is hard to see this intersection) you will find the observatory site on the South side (left) of the road. 3989 South Middle Road.

If you hit the Rochester Townline Road (you come to a stop sign) you have gone too far.

Submissions

Aurora is published monthly except for July, August and December. The September, October, January, March and May issues are full newsletters (usually 6 pages) with a number of member submitted articles. The November, February, April and June issues are short flyers (2 pages).

Submitted articles can be of any length from a paragraph to multiple pages. I can scan pictures and/or diagrams (both prints and film) to support your article and the originals will be returned to you.

Submission deadline is the 1st of the month.

Editor: Steve Mastellotto Email: mmastellotto@cogeco.ca

Membership

The Windsor Centre of The Royal Astronomical Society of Canada meets on the 3rd Tuesday of every month (except July and August) at the Ojibway Park Nature Centre. In addition to regular meetings the centre hosts a number of observing nights, a picnic and a December social. Members receive a copy of the Observer's Handbook, a subscription to SkyNews magazine and access to the Centre's library and telescopes. Optionally the RASC Journal is available in print form—online version free.

Annual Membership Fees: Please see the RASC website at www.rasc.ca for current rates.

Contact Greg Mockler at (519) 326-7255 or visit our website at <http://www.rascwindsor.com> for more information.

September 2016 Meeting Minutes by Dan Perissinotti

The monthly meeting of the Royal Astronomical Society of Canada - Windsor Center was held at the Ojibway Park Nature Centre on Tuesday September 20, 2016.

Windsor Centre **President, Randy Groundwater**, chaired the meeting and called the meeting to order at 7:47 p.m. and welcomed members and guests to the Ojibway Nature Centre. Randy invited the members to review the minutes of the June 21, 2016 meeting which were printed in the September newsletter.

A motion to accept the minutes of the June 21, 2016 membership meeting was made and the **MOTION CARRIED**.

Randy gave a brief agenda of the topics which were going to be discussed and introduced Steve Pellarin to the floor to first give a presentation on the D of O Report.

Director of Observing Report

Steve Pellarin started his presentation with recent observations over the Summer. Being a busy Summer, there was a large number of members who got back into their routine of Summer observing.

A quick overview of the Summer Triangle was shown, as well as the other popular Summer constellations. Steve also brought up a display of the sun, and its sun spots. As it was over the last month, sun spots activity is quite low. However there are still quite good viewing opportunities for auroras. The night prior to the meeting there was a large geomagnetic storm that collided with Earth, and cause a large display of northern lights to be viewed in low latitudes.

During the Summer, there was an occultation of Neptune (by the Moon) on July 23rd, though not visible in Canada. Colchester Estate Winery event took place during the Summer break as well. This was organized by Susan, and successfully raised approximately \$170. Starfest in Manitoulin was well attending this year. From our group, Randy, Steve, Al, and Tim represented Windsor at Starfest. Perseid meteor shower event took place at Point Pelee, with an attendance well above 150 people throughout the night. Fogolar Furlan culture night, presented by Steve Pellarin, entertained about 50 members from the club, with only a few opportunities to observe the sky, due to many clouds.

This past Friday, there was a partial lunar eclipse that took place in Europe. The eclipse lasted approximately 4 hours. There will be a penumbral eclipse in our region next February.

This month, Venus is quite bright in the evening. Saturn will start disappearing early in the twilight as the fall begins. Mars will continue moving to the east. Mercury will be rising in the morning sky. In the next few weeks, Mercury will be a very easy point of light to spot near the sunrise.

In October, Jupiter will start to rise, as Mercury starts to diminish. There will be a meteor shower on October 7th, called the

Draconids. This shower will produce approximately 10-15 meteors per hour, radiating from the north.

A reminder that at 10:21 a.m. on September 22, autumnal equinox takes place.

Canada South Science City Update: a new location has been secured. As part of a non-profit coop, the Science City will be located in a repurposed school, Forester. Now called Forester Community Club, located at 749 Felix Ave.

Break and 50/50 draw: went to Melissa Martin which was donated back to the centre.

Main Speaker

Randy introduced Paul Preney to give a presentation on The Heyday of NASA (www.apolloarchive.com).

Paul has taken his time and downloaded all 13,911 unprocessed images that were recently released by NASA regarding the moon landing, and the various Apollo missions. Though all files have no descriptions, they are coded through the file name. There is a website that allows one to enter the file name, and it gives a brief description of the image.

A well informed presentation of highlighted images was given by Paul.

Paul has offered to share the images he has gathered. Feel free to contact Paul via email, or ask a council member for his contact information.

Randy thanked everyone for coming out to the meeting and reminded everyone that the **next regular membership meeting** would take place **October 18th, 2016 at 7:30 p.m.** at the Ojibway Park Nature Centre.

Randy adjourned the meeting at 10:18 p.m..

At The Eyepiece: Messier Object Categories by Mike Ethier

Many of us got our start in amateur astronomy by observing the lunar surface, moving on to planets and their moons, and then into deep sky astronomy. For most of us beginners, deep sky astronomy meant the Messier objects list. Even today, nearly fifty years after my first observation, I still have not seen all of the Messier objects. This is not through oversight, but rather recognition that other objects out there are as beautiful and inspiring as the original Messier list. Someday I hope to complete my Messier observations. I am only missing about 10 of them, none of which are the really impressive ones. Most of these are galaxies.

In my relentless pursuit of the NGC catalogue, I quickly became aware just how many objects on that particular list were galaxies. At first it seemed that there was an unlimited supply of open clusters, nebula, and globular clusters. Then reality set in. I recently began wondering what the category breakdown was for Messier objects. Sure enough, it was easy enough to find on the web. Here is a brief breakdown by type of object of the 110 Messier objects.

Nebula

Supernova Remnant: M 1.

Planetary Nebula: M 27, 57, 76, 97.

Star forming Nebula (with cluster): M8, 16, 17, 20, 42, 43, 78.

Thus there are 12 nebula on the Messier list, roughly ten per cent of the total.

Open Clusters

M 6, 7, 11, 18, 21, 23, 25, 26, 29, 34, 35, 36, 37, 38, 39, 41, 44, 45, 46, 47, 48, 50, 52, 67, 93, 103.

There are 26 open clusters, just under 25 per cent of the total.

Globular Clusters

M 2, 3, 4, 5, 9, 10, 12, 13, 14, 15, 19, 22, 28, 30, 53, 54, 55, 56, 62, 68, 69, 70, 71, 72, 75, 79, 80, 92, 107.

29 globular clusters appear on Messier's list, just over 25 per cent.

Galaxies (all type)

M 31, 32, 33, 49, 51, 58, 59, 60, 61, 63, 64, 65, 66, 74, 77, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 94, 95, 96, 99, 100, 101, 102, 104, 105, 106, 108, 109, 110.

39 are galaxies, or well over one third.

Other

M 24 (star cloud), M 40 (double star), M 73 (asterism).

This is an interesting way of grouping and thinking about the famous list, and might even provide a way of comparing them by type in small telescopes or binoculars. Which Messier open cluster is your favourite? Globular? Which one looks best in a 6" scope? A 3"? A 20"? There are opportunities for seeing old favourites with new eyes.

Remember that to Messier and his small telescope, these objects were recorded so as not to mistake them for comets, which were his main interest. Viewing them in my 2" refractor, many do resemble comets.

Messier of the Month: M 52

For the second part of this month's article, I move on to the close up of a second Messier object. Last month we looked at M 27, the famous Dumbbell Nebula in Vulpecula. This time we look at a wonderful open cluster in Cassiopeia, M 52.

Oc 7654 (Messier 52): 16'; Vis. Mag. 6.9; Br. * mag. 11; 173 stars.

My first view of this amazing cluster was back in 1975, through the eyepiece of my Tasco 4.5" Lunagrosso Reflector. Here are my impressions from that late August night: "... a very beautiful cluster, but very compact... About 25 stars were resolved, best seen at 45x and using averted vision. A rather bright yellow star was observed right near the edge of the nearly circular cluster, which consisted of otherwise very faint stars..."

Observing more recently with Space Eye, my 2" refractor, I wrote the following: "It took me a while to locate M 52, even with the newly-installed red dot finder. At 30x the main bright star is seen surrounded by unresolved mist. 60x resolves about a dozen tiny, very faint stars. Not a showpiece for a 2" scope, but it does push the objective glass to its dark sky limits." No doubt my view was similar to what Messier might have seen.

Of course the rich and compressed cluster is lovely in a 6" scope, breath-taking in an 8", and large and very bright in a 12", where I have counted over 100 stars at 100x. It's virtually impossible to count them all accurately; there are simply too many. One of the best things about viewing the cluster in a larger scope is the opportunity to see "*The Ghost of 52.*" This is a large, very faint and rich background group of stars immediately following the main cluster and a tiny bit north, about half the size as M 52. Virtually no one mentions this in the literature, but it is worth checking out. I never noticed it when I used to observe with an 8" reflector, but it is very prominent with the 12". I also like how the main cluster seems to expand to the north.

And the bright star amidst the cluster? It is a multiple star, called BLL 58 (discoverer R.S. Ball, Royal Irish Academy). All five components were easily located with the 12", though the 13 mag. star required 187x. Here are the specs: *8.4-10.6/44"*; *11.2/81"*; *10.6/131"*; *13.4/18"*: Of course the real challenge here is finding the close mag. 13 star in the glare of the 8.4. There is also an even fainter one, also quite close. The 8.4 mag star appears a rich golden colour.

Just south and following M 52 is a second cluster. Cz 43 (size 7") shows up well in an 8" scope, and at low power pairs nicely with M 52. It is more than half the size of the Messier cluster, also pretty rich and obvious. A semi-circle of brighter stars forms the main section of this compact group, which bears higher magnification well. About 20 stars can be found here.

Also very close by is a famous nebula. NGC 7635, the Bubble Nebula, is about 6' preceding Cz 43, and is an easy hop from M

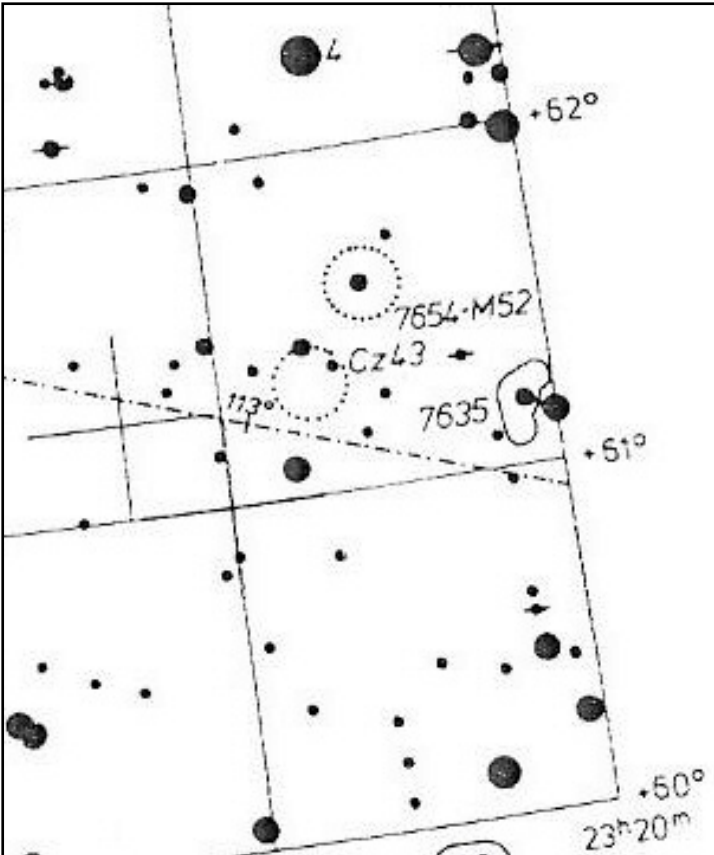
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At The Eyepiece (continued)

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52. The nebula is mostly an object for astrophotographers (who can attempt to capture all three objects in one field—see last month's newsletter for a member astrophoto), though using a filter I have seen an obvious rectangular patch just north of the attached bright star. It is an emission nebula, quite stunning in deep sky photos.

I hope you get an opportunity to observe these and many other fine objects during the autumn observing period. If you see Deb and me set up in the parking area of Hallam, come over and introduce yourself. We'll be happy to show them to you. Clear skies.



Finder chart for M52 and other objects described in At The Eyepiece Article

Proposed 2017 Council of the RASC - Windsor Centre

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1st Vice-President	Mike Mastronardi
2nd Vice-President	Rick Marion
Secretary	Dan Perissinotti
Treasurer	Greg Mockler
National Council Rep.	Mike Mastronardi

Councilors

Melissa Martin	Steve Mastellotto
Paul Pratt	Paul Preney
Dr. Susan Sawyer-Beaulieu	Tom Sobocan
Mahayarrahh Starr-Livingstone	C. Joady Ulrich

Appointed Officers

Honorary President	Dr. William Baylis
Past-President	Rick Marion
Alternative National Council Rep	Tom Sobocan
Librarian	Open Position
Recording Secretary	Dan Perissinotti
Public Education Director	Open Position
Public Relations Director	Rick Marion
Directors of Observing	Steve Mastellotto Brian Thomas
	Open Position
Light Pollution Abatement Dir.	Open Position
Hallam Observatory Director	John Marn
Aurora Editor	Steve Mastellotto
Webmaster	Steve Mastellotto

Hallam Observatory Fee

A reminder that the Hallam Observatory annual access/key fee of \$60 is now due (October 1st). Please see our Treasurer Greg Mockler at the October meeting to pay for your key. If you no longer wish to have your own access to the observatory please turn in your key to Steve Mastellotto.

Key access to Hallam Observatory is available to all RASC Windsor Centre members in good standing who have been members for at least 1 year and complete a training session on the observatory equipment. Note that an additional \$10 key cutting fee applies.

Calendars Reminder

RASC Windsor Centre - We have produced a 2017 calendar featuring the astrophotography of Windsor Centre members. The calendars are available from our Treasurer, Greg Mockler for \$20 at the regular membership meeting while supplies last. Our initial order will be 50 calendars with the option to order more.

RASC National - Greg has also taken orders for the 2017 RASC Calendar. Price is \$17.50 which includes shipping and handling as well as HST which is substantially less than ordering directly from National.

An Odd Adventure in Mirror Making (continued from page 1)

The tall, slender grinding stand may have been inspired from a style seen in an old, musty Sam Brown guide which also lay in the bottom of the box. I recognized it, too; for I'd had my nose in my own copy of that author's classic, "All About Telescopes" far too long back in the day to forget its many simple but compelling illustrations. It was a little rickety now, but the wood it was made from was still good, so I cleaned it up, replaced the old spike nails hardware with some stronger woodscrews, and gave its bare wood a coat of paint; not so much for looks as for a smoother surface that could be more easily cleaned. Finally, some weight added to the base made this once again an excellent stand on which to do work.



The mirror after fine grinding with Silicon Carbide #500. The surface at this point has become velvety smooth to the touch, but is still a very long way from the super-smoothness that polishing will eventually create. The radial lines that are drawn on its back side, seen fairly clearly through the pyrex, are used to gage the rotation of the disc under the hands while manipulating it over the tool on the grinding stand. Note the beautifully crafted, homemade Foucault tester in the background that will eventually be used in the all-important parabolizing process, once a good polish is established.

easier to mount and carry around. That would be important as I intend this future telescope to be a take-along for public events and the like.

To replace the abrasives, I called Willmann-Bell, Inc. in Richmond, Virginia, owned and operated by Perry Remaklus. They are one of the few sources left for the dwindling numbers of A.T.M.'s to turn to for their supplies, and may God bless them for that! I spoke with Perry's wife, Patricia, who, during our conversation, seemed to remember quite clearly their visit to Windsor at my invitation for a presentation to our R.A.S.C. group by Perry on mirror making, back in 1981! Shortly thereafter I received my order, which included Silicon Carbide abrasives in sizes #80, 120, 220, 320, and 500; White Aluminum Oxide Lapping Powder in 12 and 05 micron sizes; Zirconium Oxide for the polishing/ figuring stages and, last but not least, a pound of Tempered Burgundy Pitch.

With everything on hand and after nearly half a century, one warm summer's night under my hands the pyrex mirror-to-be once more met up with the plate glass tool with a charge of silicon carbide/water mix in between, and the grinding process began all over again. I'd already prepped myself with long

reads to refresh my memory, for as many of us who have done this sort of thing before, know, there are a thousand-and-one mistakes to be made in this rather lost and dark art. Fortunately, I'd probably made every one of them and even invented a couple of extra bloopers, the last time I'd ground glass! Those lessons quickly came back to me as the time passed. I have come to the conclusion that mirror grinding is not unlike swimming or riding a bicycle ... once you've done it, you never really quite forget the process.

As of this writing (late September)

I have progressed without incident, though admittedly rather slowly, and have just finished with Silicon Carbide #500 and am ready now to change over to 12-micron White Aluminum Oxide to begin the very fine grinding process. All my work so far has been done out in the garage, usually at night with the radio playing and being careful to work only when the temperature hovers around the 20 – 23 Celsius or so, range. There is only so much time to devote, so my habit has been to work through a grade of powder uninterrupted from start to finish, then do a thorough clean up and leave it for a time before doing the next. Slow and steady.



Several heavy paving stones are seen placed on the base of the waist-high stand, to improve its steadiness for the grinding and eventual polishing stage. Note the plate glass "tool" is coated with spent silicon carbide following a grinding session.

The most challenging work is, of course, still on the horizon – fabricating the pitch lap, polishing, and finally the parabolizing process. Many, many hours of work, testing, and more work lie ahead. As well, the weather will soon move the project out of the garage and indoors and this will otherwise certainly happen once I reach the polishing stage, which is now quite near, for the immediate climate must be well controlled for that stage of the work. I don't know how long it will be before the entire project comes to an end and this classic, old disc of pyrex will at last be deemed worthy of a coat of aluminum. Perhaps late winter, or the spring, I hope.

Then, of course, there will be the question of what form the structure of the actual telescope will ultimately take. But I do have some ideas for that even now as well as some parts lying around that might prove useful, hopefully someday soon.

This little story is not intended to be a "how-to" in mirror fabrication, as that would take far too many installments! Rather, I hope that it has given you some small insight into what is truly an amazing, though sadly now little-known or practiced facet of amateur astronomy.

I hope that I will be able to write another successful installment to this article in a future addition of *Aurora*. In the meantime, please wish me luck!