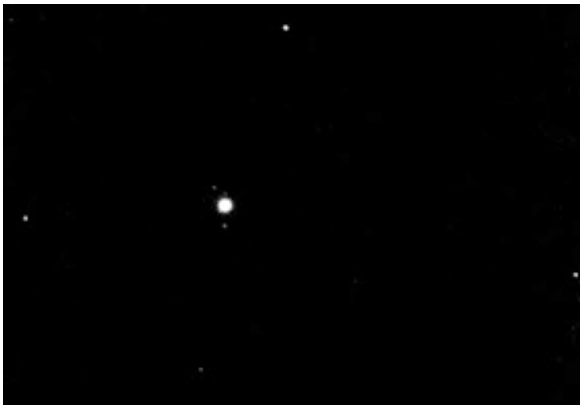
NOVA
NEWSLETTER OF THE VANCOUVER CENTRE RASC
VOLUME 2017 ISSUE 6 NOVEMBER DECEMBER 2017

A Very Long Way Out

by J. Karl Miller

One of my astronomical activities I personally much enjoy are the public daytime and nighttime astronomy events. Among the objects we observe are the Sun, the Moon, our planetary system, and "deep sky" objects, such as star clusters, gas nebulae, and our own galaxy, as well as far away galaxies. I'm particularly happy when people exclaim a "wow" about what they are seeing (nowadays the word is probably "cool"). Among those objects is the planet Saturn with its rings and moons, Jupiter and its moons, the planet Mars (when it is close to Earth), our Moon with its craters, the planets Venus with its phases and Mercury—difficult to see because it is so close to the Sun. Usually, we can see some of these "spectacular" objects in the sky at the same time.



This brings me to the subject of distances in our own solar system. By definition, the average distance from the Sun to the Earth (150 million kilometres) is called an "Astronomical Unit," AU for short. It takes light more than eight minutes to travel that distance. So we see the Sun as it was over eight minutes ago. Light travels 300,000 km in a second—it could travel around the Earth (circumference 40,000 km) more than 7 times a second. The average distances from the Sun to Mercury is about 1/3 of an AU, to Venus 2/3 AU, Earth 1 AU, Mars 1.5 AU, Jupiter 5.2 AU, Saturn a little less than 10 AU, Uranus 19.2 AU, and Neptune 30 AU. Pluto varies from about 40 to less than 30 AU; it was recently closer than Neptune. We can see all the planets only because they are illuminated by the Sun; we see them in reflected sunlight.

The distance light passes in each minute can be called a "light minute," so the Sun is over eight light minutes away. Similarly, the distance traveled by light in an hour can be called a "light hour," distance traveled by light in a year is a "light year"—the standard unit for expressing the distance to stars, nebulae, other galaxies and anywhere else in the universe outside the solar system.

The planets beyond Saturn look less spectacular in a telescope; they

continued on page 4

NOVEMBER 9 **SFU**
Youth RASC members Francesca Crema and Nevada Janzen on their Cepheid Variable study; Dr. Mark Halpern of UBC on the CHIME radio telescope. SFU

DECEMBER 14 **SFU**
Our Annual General Meeting (RASC members only). There will be no speaker. Room C9015 (Trottier Studio). See Meetup for map. SFU

JANUARY 11 **SFU**
Terence Lee of MDA, Senior Engineer on RADARSAT and Sapphire Projects. Room AQ 3005. See Meetup for details. SFU

Members' Gallery

Moon and Planets by Elena Popovici

Above: The Moon, Jupiter, and pretty sunset colours over the ocean as seen from Stanley Park at 8:30-9pm on August 25 this past summer. Right and below: The Moon and Saturn over False Creek and the Burrard Bridge. Taken at 7:30-8:30pm on September 26. Equipment: Sony ILCE-5000 Camera

President's Message

by Suzanna Nagy

This will be my last President's Message as my two-year term will be ending in December. It has been a honour and a pleasure to serve as Council President for RASC Vancouver. Your Vice-President, Leigh Cummings, has accepted the transition into the President's role and many existing Council members will continue to stand. I wish Leigh all the best for his next two years. However, I won't be disappearing but will remain on Council as Past President. I will also fill the empty position of Membership Director as Elena Popovic is stepping down and am thrilled to be sharing that role with our Youth Director, Francesca Crema. Together, we will continue Elena's good works into 2018.

Wishing you clear skies and warmest regards, Suzanna Nagy. ✸

About RASC

The RASC Vancouver Centre meets at 7:30 PM on the second Thursday of every month at SFU's Burnaby campus (see map on page 4). Guests are always welcome. In addition, the Centre has an observing site where star parties are regularly scheduled.

Membership is currently $78.00 per year ($45.00 for persons under 21 years of age; family memberships also available) and can be obtained online, at a meeting, or by writing to the Treasurer at the address below. Annual membership includes the invaluable Observer's Handbook, six issues of the RASC Journal, and, of course, access to all of the club events and projects.

For more information regarding the Centre and its activities, please contact our P.R. Director.

NOVA, the newsletter of the Vancouver Centre, RASC, is published on odd-numbered months. Opinions expressed herein are not necessarily those of the Vancouver Centre.

Material on any aspect of astronomy should be e-mailed to the editor or mailed to the address below.

Remember, you are always welcome to attend meetings of Council, held on the first Thursday of every month at 7:30pm in the Trottier Studio in the Chemistry wing of the Shrum Science Centre at SFU. Please contact a council member for directions.

2017 Vancouver Centre Officers

President	Suzanna Nagy president@rasc-vancouver.com
Vice-President	Leigh Cummings vp@rasc-vancouver.com
Secretary	Adrian Mitescu secretary@rasc-vancouver.com
Treasurer	Bruce Hutchison treasurer@rasc-vancouver.com
National Rep.	Kenneth Lui national@rasc-vancouver.com
Librarian	William Fearon library@rasc-vancouver.com
Public Relations	Scott McGilllivray publicrelations@rasc-vancouver.com
LPA	Pascal Pillot-Bruhat lpa@rasc-vancouver.com
Dir. of Telescopes	Don Duthie telescopes@rasc-vancouver.com
Observing	Robert Conrad observing@rasc-vancouver.com
Membership	Elena Popovici membership@rasc-vancouver.com
Events Coordinator	Jeremy van den Driesen events@rasc-vancouver.com
Education	Bill Burnyeat, Leigh Cummings education@rasc-vancouver.com
AOMO	Alan Jones aomo@rasc-vancouver.com
Merchandise	Kyle Dally merchandise@rasc-vancouver.com
Webmaster	Ken Jackson webmaster@rasc-vancouver.com
NOVA Editor	Gordon Farrell novaeditor@rasc-vancouver.com
Speakers	Scott McGilllivray speakers@rasc-vancouver.com
Past President	Mark Eburne
At Large	Howard Trottier, Francesca Crema
Trustee	Pomponia Martinez
Honourary President	J. Karl Miller

Library

The centre has a large library of books, magazines and old NOVAs for your enjoyment. Please take advantage of this club service and visit often to check out the new purchases. Suggestions for future library acquisitions are appreciated.

On the Internet

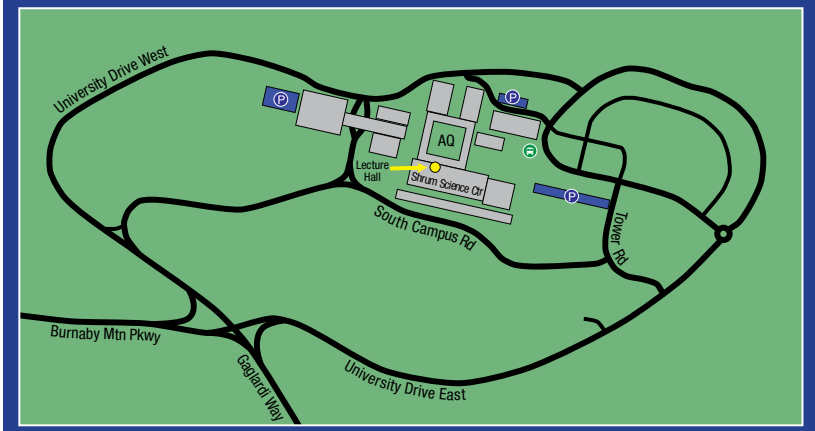
http://rasc-vancouver.com or
http://www.rasc.ca/vancouver
http://astronomy.meetup.com/131/
http://www.facebook.com/RASC.Van

@RASCVancouver

Mailing Address

RASC Vancouver Centre
PO Box 89608
9000 University High Street
Burnaby, B.C.
V5A 4Y0

Map to Meeting Site



Our Sep-Nov meetings are in room B9201 of the Shrum Science Centre, about halfway down the south concourse of the Academic Quadrangle (AQ) as indicated by the arrow on the map.

Pay parking is available at several locations located around campus (indicated as "P" on the map).

continued from page 1

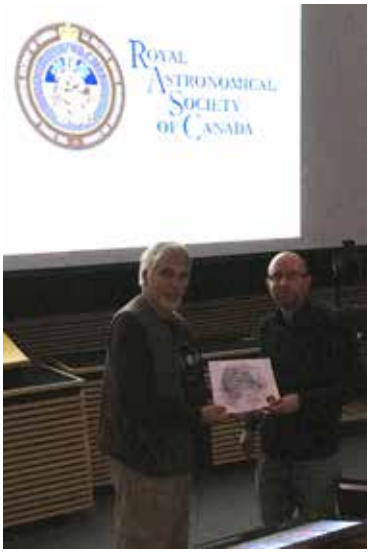
get less attention on our public nights. It is possible to gain a better "look" by taking pictures through telescopes. Here is an example of the planet Uranus I took through a Slooh.com remote control telescope, located on the Canary Islands.

The three faint "stars" you see next to Uranus are some of its moons. They are fairly difficult to see because of the brightness of Uranus. I processed the image in Photoshop to make them more easily visible.

As mentioned above, Uranus is a little less than 20 AU from the Sun. That means that it takes sunlight more than two-and-a-half HOURS to reach Uranus, and another two-and-a-half hours for that reflected sunlight to get back to Earth. Nothing can travel faster than the speed of light—our fastest spacecraft can travel at most about 50,000 km per HOUR at present. That's equal to 13.9 km per second, which makes it about 21,600 times slower than the speed of light, i.e at a speed of 50,000 km/h it takes 21,600 times 2.5 hours (6.1 years) to reach Uranus, travelling in a straight line. However, all orbits around the Sun—and the travel paths of space probes—are curved, so the time that trip takes is even longer. No wonder that it takes many months or years to get to any of the other planets at speeds we can achieve with present rocket technology.

Now, if you want, consider how long it would take for us to reach even the nearest star, which is over 4 light years away, with our currently fastest spacecraft.

The universe is huge, and things are A Long Way Out. ✸



Vancouver Centre member, Colin McKenzie receiving his Isabel Williamson Lunar Observing Program (IWLOP) award at the September meeting.

For Sale

Astrophotographers

120mm refractor "Sky-Watcher" telescope with attached digital camera "Olympus E500." $400
Phone 604-526-1864

A Failsafe Method to Charting and Locating Asteroids

by Robert Conrad

Planning in astronomy is something that we learn is critical to success. For example, viewing a faint galaxy near the zenith versus near the horizon can make the difference between seeing the object and it being completely invisible. Charting and locating asteroids (especially the fainter ones) also requires careful planning and can be very rewarding. When an asteroid is nestled in a rich star field of many stars of similar magnitude, how can you be certain you're looking at the asteroid and not just another star? In this article, I'll walk you through my fail-safe process that will even enable you to locate asteroids from light-polluted urban areas. The best news is that it doesn't require any GOTO electronics, expensive star charts, or years of experience. Even if you have a GOTO scope, it won't help you differentiate the asteroid from the other stars in some cases and often the object is off-centre anyway. Using this process, I can successfully locate 30-40 asteroids in any given night down to magnitude 13, and that is in between my night of star-hopping to other countless deep sky objects. If you're new to star-hopping, locating asteroids is also a good warm up for those parts of the brain that will serve you well for the remainder of the night.

The first step is knowing which asteroids are within reach of your telescope and the level of darkness where you will be viewing. Now, where can we find asteroids to view? There are a variety of websites, my favourites being these three:

http://www.heavens-above.com/Asteroids.aspx?lat=49.3137&lng=-123.082&loc=Unspecified&alt=26&tz=PST

https://theskylive.com/asteroids-and-dwarf-planets

https://www.calsky.com/cs.cgi (at the top, click asteroids, then nighttime asteroids, then select the magnitude range and hit GO)

Once you have a list of asteroids that you want to view, you need to locate the declination and right ascension for the approximate time that you'll be viewing. The best program for this is Stellarium (free and available for Mac and PC) so that you can also choose a time when the asteroid will be high enough in the sky. Stellarium has some of the brighter asteroids (also known as dwarf planets, like Ceres, Vesta, Pallas, etc. but you can literally add hundreds). You can add any asteroid to Stellarium by following the steps on page 6.

Now that we've added all the asteroids we want to Stellarium, we need to decide the approximate time we will view that object. Ideally, we want to view an object when

continued on page 6

Membership has its Privileges!

Are you tired of looking at the same objects again and again (planets, moon, etc.)? Is your telescope collecting dust because it's hard to locate deep sky objects? Would you like to bring your observing to a stellar level? Robert Conrad, our new observing director, revived the Vancouver RASC observing group and invites you to join by sending him an email at observing@rasc-vancouver.com. Some of the benefits of belonging to this group include:

- Hands on training on how to operate the sfu Trottier observatory
- Weekly observing sessions at the observatory or at dark sky locations
- One-one-one coaching on how to locate thousands of objects in the night sky
- Attend small interactive seminars delivered by Robert on a range of topics including failsafe star-hopping, charting challenging objects and understanding the motions of the cosmos
- Learn to make your telescope dance by locating objects such as asteroids, nova, and supernovae
- Spectroscopy and imaging training from Howard Trottier and an opportunity to collaborate on observatory research projects
- Updates on observable sky events happening during the week like asteroid/comet/deep sky conjunctions
- Access to observing guides and lists that Robert created that took hundreds of hours to create and will help with planning observing sessions
- Knowledge and expertise from other observing group members
- Learn how to quickly and efficiently find and star-hop to deep sky objects using a range of binoculars and telescopes

Upcoming Events

December
14 – AGM

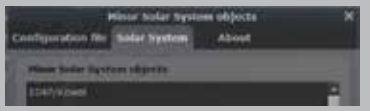
Adding Asteroids to Stellarium

Hover your mouse over the left side of the screen and select Configuration window:

Click the Plugins tab:

On the left side of the screen scroll down and highlight Solar System Editor. Then click the Configure button.

Click the Solar System tab:



Click the following button:

Ensure the Asteroids radio button is selected and then click the Online search tab.

Enter the name of the asteroid you want to add to Stellarium and click the search button (magnifying glass):

Place a checkmark in the box next to the name of the asteroid and click the Add objects button at the bottom of the dialog box.

Now you can search for the asteroid in Stellarium. Hover your mouse over the left side of the screen and select the Search window:

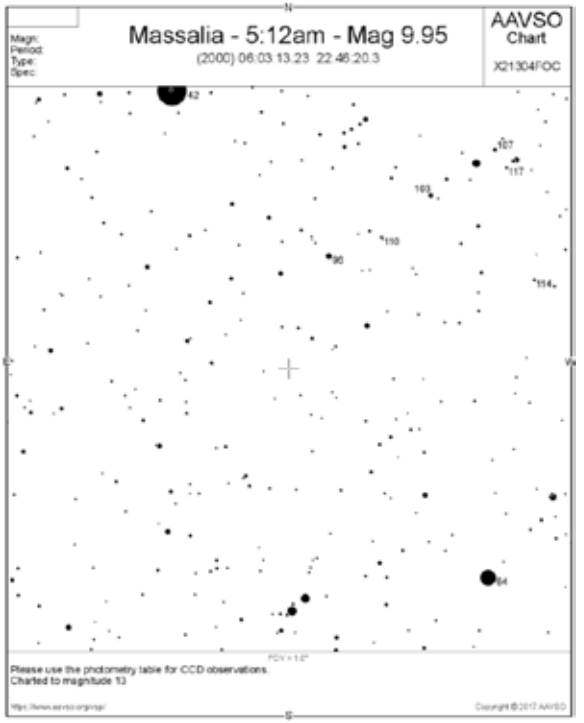
continued from page 5

it is highest in the sky (i.e. when it passes the meridian line or in the case of an object in the north direction, when it is nearest the zenith). However, for asteroids, as they are points of light, this isn't as critical (unless you are observing from very light polluted skies).

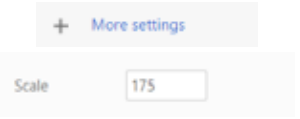
In the case of asteroid Massalia, I can see it passes the meridian line at 5:12am. You can add the meridian line in Stellarium by going into the **Sky and Viewing Options** Window, clicking the **Markings** tab, and placing a checkmark in the **Meridian** box.

Now that we have the coordinates, we're going to plot this asteroid using the **AAVSO Plotter** (see page 8).

I need to note the right ascension and declination for 5:12am. Remember that asteroids and comets have variable coordinates, so these will change as you advance the time backward or forward or change the date. You can find the **(J2000.0) coordinates** in the upper left corner of the screen. In this case, RA = 06:03:13.23 and DEC = 22:46:20.3.



When the page displays (above right), click on it once to frame it for printing. Then right click and select Print. In the More settings window (click + to expand), ensure the scale is set to 175 so that it fills the 8.5x11 page:



Print this page and with a pencil/pen, circle a bright star near the asteroid (the crosshair is the location of the asteroid; see image at the top of page 9).

Now we need to locate the correct Trialtas C-set chart we will use for starhopping. These free charts (down to magnitude 13) can be found free here: (**Note:** the numbers that you see in the image above are magnitudes without the decimal. For example, the star I circled is magnitude 6.4).

https://www.uv.es/jrtorres/triatlas.html

Scroll down the page until you see the table on page 9. You want the 8x11 C-set charts which are a good scale for telescope starhopping (1 degree = approximately 20mm).

We know the coordinates of Massalia that we plotted on the AAVSO chart were RA = 06:03:13.23 and

continued on page 8

Plotting Asteriods with AAVSO Plotter

AAVSO Plotter can be found here: https://www.aavso.org/apps/vsp/

Leave this field blank:

Enter the RA and DEC in this format:

Leave this field as is:

For chart orientation, select Visual (usually the default). Note: The only time you would select "Reversed" is if your telescope setup results in a horizontal (or mirrored) flip which is often the case of refractors that have a standard star diagonal. If you choose this option, make sure that later when you print out the Triatlas C-set chart pages that you set up your printer to perform a horizontal (mirror) flip before printing so they match the custom aavso chart you generated (not all printers have this driver option so if not you can use the full version of Adobe Acrobat DC to perform a horizontal flip. I have also done this for you already and placed them on my Google Drive. You can access here: https://drive.google.com/open?id=0B3OWwyrmIJowbjM0R0h4ZFRsMUE)

For the Plot a finder chart, select Chart.

For the fov field, I usually select 60 arcminutes which is 1 degree. My wide-angle eyepiece that I use to star-hop is 1.5 degrees, so I could choose 90 arcminutes, however 1 degree is fine.

The magnitude limit field is important. Be sure to select the appropriate magnitude for the environment where you will be viewing. For me, if I am viewing in an urban setting, I will select 12, rural 13, and darkest location 14. These will vary depending on your scope limits and experience with these settings.

For the resolution field, I leave it at 150—it just refers to the quality of the print (i.e. dpi).

In the title field, I usually put the name of the asteroid, the time I charted it for, and the magnitude.

In the comments section, I usually enter the magnitude limit I used to chart the object—in this case magnitude 13.

To ensure that the custom chart matches the orientation of other sky atlases and the Triatlas charts we will be using in further steps, ensure North Up is selected for North-South orientation and East Left is selected for East-West orientation. Note: If you selected "Reversed" earlier for Chart Orientation, then it will automatically select North Up and East Right (therefore leave like this if your telescope has this orientation).

Leave all other settings as is, scroll back up and click the button: Plot Chart

continued from page 7

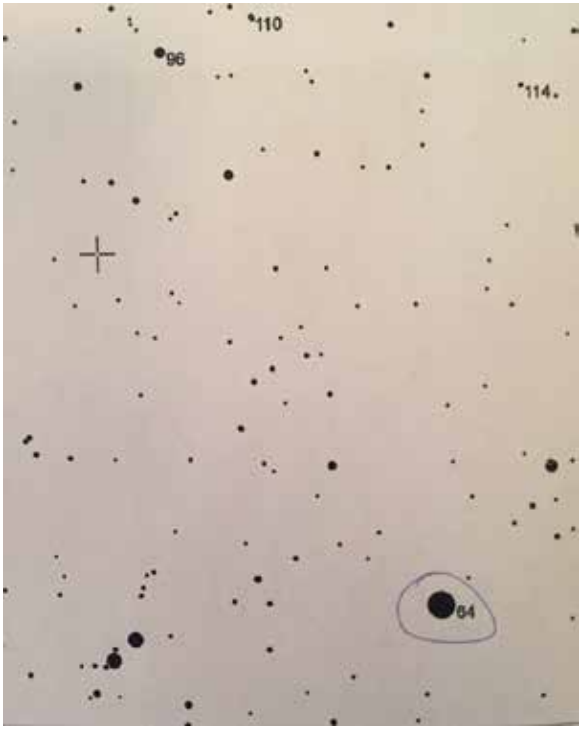
DEC = 22:46:20.3 and looking in Stellarium we can see the asteroid is in the feet of the constellation Gemini. Click on the **Index to C charts** link to bring up a diagram that will tell you the correct chart # you need to locate the asteroid:

Use the zoom (+) button to get a clearer view:

You can see comparing the image of the asteroid in Stellarium to the index that we need chart C 203 (next page).

Therefore, open the PDF set 07 which contains charts 181 to 210.

- **PDF 07: Charts 181 to 210**



Links to download C-SET (letter page, 8x11", USA):

- PDF 01: Charts 001 to 030
- PDF 02: Charts 031 to 060
- PDF 03: Charts 061 to 090
- PDF 04: Charts 091 to 120
- PDF 05: Charts 121 to 150
- PDF 06: Charts 151 to 180
- PDF 07: Charts 181 to 210
- PDF 08: Charts 211 to 240
- PDF 09: Charts 241 to 270
- PDF 10: Charts 271 to 300
- PDF 11: Charts 301 to 330
- PDF 12: Charts 331 to 360
- PDF 13: Charts 361 to 390
- PDF 14: Charts 391 to 420
- PDF 15: Charts 421 to 450
- PDF 16: Charts 451 to 480
- PDF 17: Charts 481 to 510
- PDF 18: Charts 511 to 540
- PDF 19: Charts 541 to 570

- Index to C charts 2nd edition (Key map)

Print chart C 203 (see page 10).

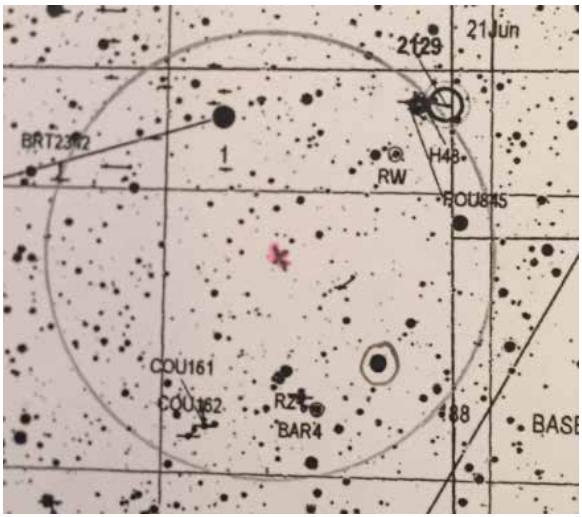
Using the coordinates for the asteroid Massalia, place an "x" on Chart C 203. Draw your field of view circle that matches your wide-angle eyepiece around the asteroid (See Appendix A for instructions on drawing the correct size FOV circle). Draw a circle around the star that you circled on the AAVSO chart earlier (right).

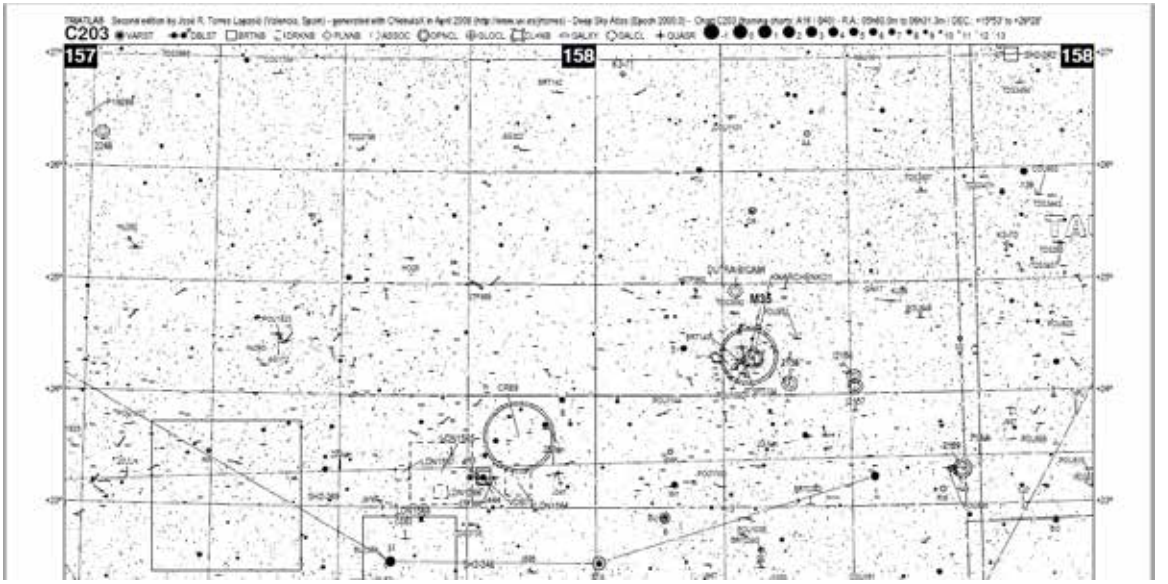
You will also want to ensure that the star you will start your star-hop from is on the same C set chart as the asteroid. In this case we can easily see Mu, Eta or 1 Gemini so we're good. Otherwise we might need to print an extra C-set page. Notice the connecting chart numbers can be found on the top, bottom, left, right and corners of the chart page.

In the field, you will use the C-set Charts to star-hop to the star you circled. Once you find that star and centre it in the eyepiece, you can move over to the detailed AAVSO chart you custom created starting at the star you circled. Once I find the star I circled, I will often switch to a higher magnification to navigate from the circled star to the asteroid using the AAVSO chart. This will also allow you to see fainter stars.

Using the AAVSO custom charting can also be very effective when charting hard to find objects like faint quasars, com-

continued on page 10





continued from page 9

ets and supernovas.

Note: Be sure to orient the C-set and AAVSO chart correctly based on its position in the sky. In most cases, if you're using a reflector telescope, you'll need to flip both pages upside down to start. By comparing the FOV circle you've drawn (for example on your starting star-hop star) to what you see in the eyepiece, you'll know the correct orientation and how to hold the pages. This will then help you as you are nudging your telescope left/right and up/down.

Note: If you'd like clarification on anything in this document or want one-on-one coaching, contact me at observing@rasc-vancouver.com **or** ubishops@gmail.com ✸

Appendix A – Drawing fov Circles

To determine the size of the circle that you need to draw on any given chart/atlas, follow these steps):

Determine the magnification of the wide-angle eyepiece you will use for star-hopping. To calculate magnification, use this formula:

Focal length of the telescope (mm)/Focal length of the eyepiece (mm)

Example:
1524mm/32mm = 47.625 X

Then to calculate the True Field of View (TFOV), use the following formula:

Apparent field of View (AFOV) of eyepiece (in degrees)/Magnification of eyepiece

Example: 70/47.625 = 1.47 degrees

Finally, to determine the size of the circle to draw you need to know the scale of the chart. For the Triatlas Charts, the scale of the C-set charts is 1 degree = 20mm. So, to draw a circle that represents my 32mm eyepiece in my telescope, I would draw a circle with a diameter 29mm (radius 14.7mm).

Not all eyepieces have the afov printed on them. If this is the case, contact the manufacturer of the telescope (if the eyepieces were included). You may also find it by doing a Google search.

Science Bash in Richmond

by Suzanna Nagy

The Science Bash at the Richmond Public Library has become an annual event for us. It is held on the Pro-D day in October and the Richmond Brighouse Public Library invites various science-based organizations to participate. This year there were only two volunteers from RASC that could attend, myself and Jeremy van den Driesen. As a result, we had to limit our participation to an activity or display that didn't require a lot of direct interaction with the children. We decided to take our Jim Bernath Collection which is a display of space-related metal and alloys used in the construction of spacecraft, with items children can easily pick up and touch. We also took along a meteorite and the Bottomless Box which re-creates how light disappears into a black hole. Jeremy and I engaged with approximately 250 principally elementary school-aged children. It was a very busy afternoon but Jeremy and I enjoyed engaging with the children (and some curious adults as well). We were in direct competition with a display across from us where children were making DNA strands out of Twizzler candy and marshmallows but I think Jeremy and I did a good job of drawing the crowds over, anyways. Looking forward to next year. ✸

The Triangulum Galaxy (M33) by Ken Jackson

I did some deep-sky imaging from outside of Hood River, Oregon while waiting for the Eclipse. This is M33—the Triangulum Galaxy—taken using a Nikon D5100 and Skywatcher Esprit 80 with a total exposure of 50 mins. Processed with DeepSkyStacker and PixInsight.