NOVA
NEWSLETTER OF THE VANCOUVER CENTRE RASC
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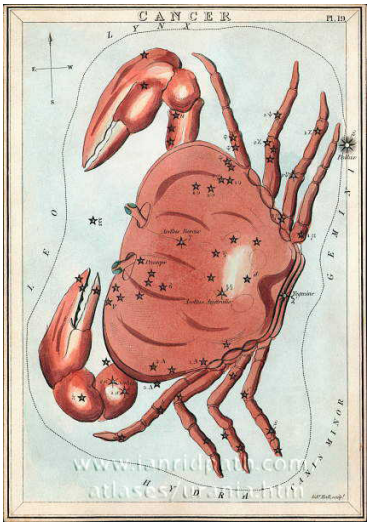
Cancer

by Bill Burnyeat

The Crab is absent. Observing it is like strolling onto a lonely beach with puzzling scratches in the sand; the scuttling sign of a shy creature's passage unobserved.

This is the zodiac sign where much is missing. It's the silences between notes that drive the music of the spheres; it's the blank part of the sky. City dwellers, counting Twins, watching Leo, must wonder where the Crab has gotten to. Has it waltzed sideways to some starry shore on the other side of the sky?

Constellations come in two types, to revert to the crudest classification. Some are royal signs dominated by a bright star, like Arcturus in Bootes and Sirius the sparkler of Canis Major. Others nurture republican sentiments and display sets of nearly equal stars, with none exciting the envy of its neighbours. Cassiopeia and Sagittarius come to mind. Cancer is of this latter group, yet has taken equality to an extreme of invisibility. Its leader, alpha, is fainter than magnitude four, and Cancer has no star brighter than beta (magnitude 3.5). Only Pisces, another sea creature, whose fires seem squelched by watery influences,



has less to brag about in the bright star department.

So why does Cancer rate continual looks in its direction?

It is a cold, bristly dusk in Likely, British Columbia, a hamlet with one hotel, no gas station, and an hour's drive from the Cariboo highway. I was strolling across a farmyard and casting sidelong glances up into the sky. I had to be careful for it was so dark I might have easily walked right into a tree, or fallen into a well like Thales ,the inattentive astronomer. The Crab now stood out, faint stars not seen under city skies now answered muster and shine out. Within the heart of the Crab, assuming this organ is placed amidships of the claws, was glowing a sort of very small cloud that lingered and showed no signs of retreating with the evening breeze. It looked like a pale eraser had been applied to the celestial sphere creating a smudge. The remote Cariboo town sports views of objects the way the original astronomers enjoyed. Driving back to the highway I was briefly shadowed by an eagle (Aquila?) whose wings spanned more than the lane of the

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MARCH 14 DOUGLAS COLLEGE
Ian McLennan will speak on his career building and advising planetariums and science centres.
Room 2201 (follow the signs).

APRIL 11 UBC
Christiaan Sterken from the University of Brussels: From Celestial Cartography to Asteroseismology – A Story of 1001 Nights. Hennings 201

MAY 9 UBC
Douglas Scott of UBC: The First Results from the Plank Spacecraft. Hennings 201 (see map on p. 4)

Members' Gallery

The Moon in Colour by Gordon Farrell

The Moon isn't the drab, grey sphere it appears to be. The colours may be subtle, but by processing the above image to exaggerate colour saturation, the colour variation becomes apparent. The Mare in the south are a rich, navy blue while those in the north are a pale ochre. Where the two meet, there are hints of purple, each colour hinting at the composition of the local lunar surface. Image details: Canon 40D at ISO 400 through a Celestron G5 scope, stacked in RegiStax and processed in Photoshop. ✸

President's Message

by Mark Eburne

Spring is in the air and familiar treasures are in the night sky... well, according to my Sky X software, anyway. It is true that our clear nights have been very rare so far this year due to our famous west coast cloudy winters. In fact it has been so poor I am starting to think the book *50 Shades of Grey* is about frustrated astronomers. Well, we must all stay positive as we know that one day soon we will get a run of clear, steady skies to satisfy our appetite for celestial goodies. Stay ready everyone.

In the meantime, you can enjoy many other astronomy events such as the regular RASC-hosted talks held on the second Thursday of each month. Our March meeting at Douglas College has Ian MacLennan giving a talk entitled, "Looking Back and Looking Up" - stories from a lifetime consulting for science centers and planetariums around the world. April has us back at the wonderful Hennings Building at UBC where Christian Sterken of the University of Brussels will be presenting a talk entitled, "From Celestial Cartography to Astroseismology – A Story of 1001 Nights." Make sure you check out our website at www.rasc-

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About RASC

The RASC Vancouver Centre meets at 7:30 PM on the second Thursday of every month at various locations in Metro Vancouver (see page 1 for meeting locations and page 4 for maps). Guests are always welcome. In addition, the Centre has an observing site where star parties are regularly scheduled.

Membership is currently $73.00 per year ($41.00 for persons under 21 years of age) and can be obtained by writing to the Treasurer at the address on page 5. 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 room P8445.2 of the Physics wing of the Shrum Science Centre at SFU. Please contact a council member for directions.

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Trustees Ron Jerome
Pomponia Martines
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

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Mailing Address

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Maps to Meeting Sites

UBC

Our UBC meeting site is in room 201 of the Hennings Building. The main entrance is off Agricultural Rd. (indicated by the arrow on the map at left). Room 201 is up the stairs and on the left.

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

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vancouver.com for further details and sign up with Meetup at www.meetup.com/astronomy-131 to get all the events sent to you directly.

Activity at the AOMO is starting to pick up again after a winter of hibernation (the users, not the observatory). The AOMO, Antony Overton Memorial Observatory, located in the UBC forest lands, is our club's scope housed in a fine observatory building. There is an observing pad and a few portable telescopes that can be used for visual observing. Contact the Chair of the AOMO for further information.

We are also fortunate to have Scott McGillivray (observing@rasc-vancouver.com), our observing Chair, who is working hard to host observing sessions whenever the sky shows promise of clearing off. Follow Scott on Meetup, Twitter and Facebook and see where he will be.

On the national scene, we are coming down to the wire to get our new constitutional structure in place to meet the new CRA rules. Several of your national council and centre volunteers have worked tirelessly to draft and redraft By-Law policy manuals and organizational processes. Healthy and productive dialogue has gone on for some time now in the RASC discussion groups and details are available at the national website, www.rasc.ca. This is an important topic and will impact each of us as members down the road so please take a few minutes to check it out.

I would also like to give a plug to the upcoming RASC General Assembly being held from June 27 to July 1, 2013 in Thunder Bay, Ontario. Everything from a night sky photo workshop to outstanding speakers like Dr. Sara Seager is planned for this event. Check out the GA website

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cartoon by Dan Collier

The Best Telescope in the World Costs Under $100 by Scott McGillivray

If you do not own a Celestron Travelscope... you should.

I have been a member of the Royal Astronomical Society of Canada since 2008. I had always been interested in the stars, although until 2011 I had never owned a telescope. I joined the Vancouver RASC Centre specifically for the loaner program. After borrowing a heavy Dobsonian, a motorized GoTo scope with a 20-minute setup process, and a long refractor that only fit in my trunk if I dropped the back seat, I was turned off from observing because there was too much hassle before I could look at anything.

Last February, I had the opportunity to spend two months in Arizona. If you've been to Arizona, you'll know the air is dry, clouds are non-existent, and they have the most enforced light pollution laws in the world. When you look up at night, even in downtown Tucson, there's a good chance you'll see the Milky Way. As a RASC member, I felt obligated to buy a scope before going to Arizona.

Choosing a scope was easy. I had three simple requirements: 1) Easy to transport and store, 2) Simple to use, and 3) less than $100. I chose a **Celestron Travel Scope 50** because at $89 it's a full setup with a small selection of accessories. The scope is a 50mm refractor with two eyepieces, finder-scope, image diagonal, and a small tripod, all of which fold up into a black backpack which is also included.

There has never been a more convenient telescope than this one. I usually leave it in my car so it's always available. It's not like the backpack takes up any space and if it gets stolen or broken I can just buy another for $89. I can set it up for observing in under a minute. The little guy has travelled in my carry-on baggage about five times and I always bring it hiking, camping, and even to sporting events. Yes, I've brought it to several baseball games; even from the cheapest seat in the house, I feel like I'm on the field. The image diagonal corrects the orientation and I can read the players' tattoos by aiming at home plate (where most of the action happens in baseball). Did you know some baseball catchers wear neon nail-polish to help the pitcher see their finger signals?

Today I own three telescopes and my Travelscope is the

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for further details at www.rasc.ca/events/home.

As for our local centre, to date our membership remains solid with new members joining each month. Revenues and expenses for 2013 have been budgeted and are being managed effectively. We are always seeking project proposals from members to advance astronomy outreach. RASC Vancouver continues to be a leader in bringing astronomy to the public. Thanks to the dedicated council and numerous volunteers and a strong membership, we will continue to expand that role.

As you can see, there is a lot to do under the dull grey skies of the west coast when it comes to astronomy. Stay active and enjoy the science.

Clear skies, everyone. ✸

– Mark Eburne

Membership has its Privileges!

New members, did you know? The Vancouver Centre has 8 telescopes available for loan free of charge! We have telescopes ranging from 60mm to 10" diameter. For more information see the Director of Telescopes after the members meeting. The loaner period is for one month, to be returned after the next meeting. Telescopes are not allowed to circulate outside of these meetings. You can now reserve two different telescopes per year and use what is left at the end of the meeting anytime.

Your greatest opportunity as a member of the RASC is to take advantage of the company of other enthusiasts to increase your knowledge, enjoyment and skill in astronomy.

The best thing you can do to gain the most from your membership is to get active! Take in the club meetings; engage other members with questions; come out to observing sessions (also known as "star parties"), and, by all means, volunteer to take part in our many public events.

For the usual observing sites and times, visit our website at http://rasc-vancouver.com/observing-sites/ or contact the Observing Chair at observing.rascvancouver@gmail.com.

Upcoming Events

March
16 – Night Quest at Pacific Spirit Park

April
27 – International Astronomy Day at SFU

August
Aug. 3 - 11 – Mt. Kobau Star Party

September
Aug. 31 - Sept. 7 – Merritt Star Quest

December
8 – AGM

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highway in front of the truck. It's magical observing and matched by magical animals.

So just what is that cloudy thing in the middle of the Crab? The little cloud is mentioned in Sky Signs, a minor work of Theophrastus (he got Aristotle's office), and appears in writings long before the invention of the telescope. The Latin for cloud is "nubes" and so, here and there are small lucid spots and these come to be called "nebulae."

Fanciful theories abounded as to the nature of the nebulae. My favourite is that the mark in the Crab is a burn made by the sun on the surface of the celestial globe as the sun formerly reached its highest point in the heavens here on June 21st.

It was the development of the telescope that changed the status of the cloud into a small gathering of stars. Galileo was first to turn the smudge into about three dozen faint stars. A good pair of binoculars will do the same, and in a small glass it has often seemed to me that the Crab cluster, called the Beehive, or Praesepe, looks a bit like the unaided eye view of the Hyades in nearby Taurus. The resemblance was not lost on the first generations of those using telescopes. Charles Messier labelled the Beehive as M44. He wrote that objects in telescopes that appear as fog or mist in the naked eye or shown to be composed of stars by instruments, and that, he implies, all nebulous objects would reveal themselves as star-composed if larger and more powerful telescopes were brought to bear on them. This was the suspicion of William Herschel. Messier's own description of objects like M13—calling it a small, round nebula that "contains no stars"—is, of course, true in a finder scope but definitely untrue in a good-sized backyard telescope. Yet, for Messier and the other astronomers of the 18th and 19th century, the success in seeing some objects dissolve into star in bigger and better scopes encouraged the belief that sooner or later every cloudy object would be thus revealed. The confidence led Lord Rosse, at the eyepiece of the 72-inch giant telescope, to believe he had resolved the Great Nebula in Orion into a cloud of very tiny stars. Another object he claimed to "resolve" was M27, the Dumbbell Nebula. This object, of course, is a planetary nebula and a true gaseous envelope about one star.

One night, in the east Kootenay Provincial Park at Moyie Lake, it was incredibly dark. I had just set the 25-inch Community Astronomy telescope on the boat launch and had been showing a large crowd Jupiter, which sat over the lake in the distance. After the crowd had dispersed, I was alone except for a smallish skunk that had come to forage at the shore line. I turned the big Dob to the Dumbbell. It appeared very blue, and what appears to be the major axis in small scopes is really the minor axis of a vastly larger complex. As I looked, I could see the twinkling and intermittent visibility of very faint stars. I had never noticed these stars in any of the smaller 17.5-inch scopes. I thought of Lord Rosse and imagined myself supposing that I had uncovered the secret component stars that might make up this diffuse shape in the sky.

The opinion of the universal resolvability of cloudy looking objects was no mere intellectual curiosity—the puzzle and concern of a few people with telescopes. The verdict impinged on an assumption taken up by the early modern Cosmology. The Laplacian Nebular Hypothesis envisioned clouds of gas out of which the solar system had emerged. That these should be unearthed as appendages of stars seemed to poke holes in the system of astronomy. If Laplacian clouds had formed our system long ago, why were there no other developing structures in the cosmos? There was a climate of opinion in the

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Not All the Stars are in the Sky

by Leigh Cummings

My wife's gift of a pair of binoculars years back re-ignited my interest in the night sky. At first I was content to sit out in the back yard and struggle to find interesting objects to look at. That struggle proved to be nothing compared to the learning curve that I encountered when my wife bought me a telescope on an equatorial mount a year later.

I was starting to founder in my quest to learn how to use my new equipment when a chance encounter with a fellow amateur astronomer, Bill Irwin, at the Vancouver Telescope Centre changed everything. He told me about a star party being held in a couple of weeks' time in the Okanagan, at a place called Mount Kobau, and how I would benefit from being around other, more seasoned astronomers. I told him I would check it out online and maybe see him up there.

I ended up attending the Mount Kobau Star Party for a couple of nights that year and then a whole week the year after. It was an incredible experience. I can state that it was life changing. I met Wayne Lyons at Mount Kobau and he suggested I get in touch with him after I return home. He lived quite near me and thought I would enjoy doing some astronomy with him. It wasn't long before I became a member of the Royal Astronomical Society of Canada and the rest is history, as they say.

My next milestone in astronomy came about after helping Wayne with a couple of outreach viewing nights around Maple Ridge. It turns out I really enjoyed showing the public—and especially kids—the wonders of viewing the night sky through a telescope. I enjoyed it so much that I jumped at the chance to get involved in Howard's StarryNights program at SFU. That really whetted my appetite for working with young people. I found it so exciting to watch them grasp concepts with such ease that challenged me. I have since taken more opportunities to make myself available to put on presentations for youth groups whenever possible.

In February, I got the opportunity to put on a double header. I was invited by leader Rhiannon McKechnie of the 5th Brownies of Port Moody to give a presentation on February 26th to her troop in order for them to earn their astronomy badge. Fellow members Rohit Grover and William Fearon also jumped at the chance to help out. I was also invited by leader Julia Higo of Maple Ridge's 1st Alouette Girl Guides to give a presentation on the next night to allow them to earn their astronomy badge. I had Wayne Lyons jump at the chance to give me a hand on that night.

My presentation to the Brownies consisted of what to find in the night sky and where to find it. I have to confess it is a huge amount of fun putting these presentations on—and a little intimidating. I find the young people today are incredibly well educated at whatever age and grade level they are at. Our Brownie group that night consisted of twenty-plus 7 and 8 year olds as well as four adults. The leaders were very enthusiastic and were very engaged in our talk, but the young ladies really impressed me. The questions they asked were not only challenging for me but showed a strong background in the science they are learning in school.

During a slide of Mark's showing M42, I asked what it was. After a couple of close answers, I got one Brownie telling me it was a cloud of dust. I told her that was correct enough and was ready to move on when another hand went up. She looked so excited I couldn't resist hearing what she had to say. I was blown away when this 8 year old informed me that this was the place where stars are born. I have to admit I didn't see that one coming. This is why I love putting on these events for youth groups! The rest of the night was filled with answers that showed an incredible knowledge about astronomy and science in general for young people of their age group. I also cannot point out enough how much help is was to have Rohit and William there to rescue me when the questions were over my head. Thanks guys!!! Now if only the weather would co-operate.

I took the next day off work so that I could tweak my presentation for the Guides. After the night before, I did not want to find my presentation too elementary for the older young women. I also had to brush up on some of the names and facts in hopes of being able to answer at least some of their questions. I knew I was lucky to have Wayne, such a great observer, to help out.

We met the 1st Alouette Girl Guides at Alexander Robinson Elementary School in Maple Ridge

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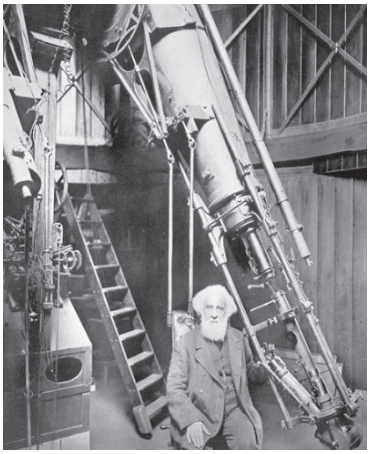
Victorian world that made this an unwelcome development in a world looking increasingly materialistic and secular. Could the solar system have been formed not in a routine and observable process but in an exceptional, or one time, act of creation? This was similar to the debates about the evolution of species that would erupt in the middle of the 19th Century.

This was Herschel's belief in 1787; after all, he had used his bigger telescopes' to show the resolvability of objects that remained fog in very small glasses. He had more reason than most to suppose this would continue until all deep sky objects were shown to be collections of stars. After a few more years at the telescopes, he began to have doubts. By 1791, he wrote that some of the objects he viewed, especially in Orion, seemed to be legitimately gaseous and not just unresolved clusters. Herschel observed wisps and a fluid like structure in the gas clouds that made him doubt that these would be the evidence of very distant suns. He came to conclude that a fine gaseous medium exists between the stars. Thus two opposite beliefs were set in motion, those insisting that more and more deep sky objects would reveal themselves as star clusters and those who saw at least some of the clouds to be real gas envelops out of which new solar systems would evolve. The debate continued and it looked as though the problem might be intractable. Then, all of a sudden, the truth became clear.

On the night of August 29, 1864, the Union General William Tecumseh Sherman was getting ready to accept the surrender of the Confederate defenders of Atlanta, Georgia. Far from the eyes of the world, in his private observatory outside London, William Huggins directed his telescope towards a planetary nebula in Draco—the one called the Cat's Eye. Huggins, records his feeling of suspense and awe as he peers into a prism spectrograph set for visual observation. He writes of that moment:

"I looked into the spectroscope. No spectrum such as I expected. A single bright line only!"



What did Huggins see? Why was this a Eureka moment where all that is mysterious suddenly becomes clear?

To understand the issue, let's consider some Victorian household furnishings. It was the custom then (and it's still done in overpriced McMansions) to dangle triangular lengths of glass from chandeliers and candlesticks. Theses decorations were called lustres. In the light they produced very pleasant rainbows which one could see projected on walls and ceilings where they danced and dazzled. In sunlight or in the lights of candles and gas lanterns,

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the next evening. This time we had about twenty-five Guides and four leaders to introduce to the night sky. Unfortunately, the weather was still being uncooperative so we were going to rely on our indoor show.

Wayne stuck some astronomy posters at one end of the gym while I set up my Vixen 95mm on my camera tripod at the other end of the gym. That and Wayne's demonstration lesson of the star wheels was going to be the full amount of my hands-on portion of the night.

After the Guides opening ceremony, the leaders had some projects for the girls to demonstrate. We were very impressed by a demonstration of water filtration by layers of ground soil and sand that was put on. I felt like volunteering to drink the water but thought that might be a little bravado that I would regret later, so I kept my own council on that thought.

Julia had arranged for the school projector and screen so we were being spoiled that night. Wayne put on a great lesson with the star wheels while I got my presentation loaded and ready. In fact, Wayne was doing such a great job that I was afraid my presentation would become redundant. Fortunately for me, I had the use of some great images from Mark, Masoud, Wayne and Howard that are always attention grabbers—especially on the big movie screen.

Once again, I found myself impressed by the quality of their questions, and the answers that they gave to Wayne's and my questions. My one small regret is not being able to take the time to answer one important question. One young lady asked how a telescope works. I asked her if we could talk about that after the presentation when we were planning to have them all look through my telescope at the posters. Sadly here question never got back to the fore that evening. I did give the leaders information about Howard's StarryNights with hope that they will take advantage of his fantastic program to delve deeper into the physics of light as well as astronomy.

I hope that I was able to stimulate all these young ladies' interest in astronomy. Whether any of them pursue a career in science or not, I know that the night sky is there for all of us to enjoy, and a knowledge of how to find our way in the night sky is always going to be rewarding. I look forward to more evenings with the Guides, Brownies, Scouts and Cub Scouts in the future. I also have some requests from school teachers to use the AOMO for a field trip in astronomy. I look forward to doing my best to help out all these groups, as well as all the other outreach projects that RASC allows me to participate in.

I think that I benefit the most from my interactions with all these young people. As I begin my 7th decade of journeys around our star, it gives me great hope for mankind's future seeing all these potential new stars in our human universe. Who knows if I have already talked to the next great discoverer of knowledge? If not, then I at least had a real blast enjoying their enthusiasm. I highly recommend being involved in our outreach programs. ✸

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runaway favourite. Astronomy is a spontaneous activity, especially with the unpredictable and usually unfavourable Vancouver weather. My most powerful scope is a $2,000 Schmit Cassegrain on an Equatorial GoTo mount. I have to plan carefully when I want to use this combo. Preparation involves three trips carrying heavy boxes + tripod from my apartment to my car, followed by a 30 minute assembly + alignment once I'm onsite. Then I have to disassemble and carry the boxes back upstairs when I'm done. It's only worth it if I know I'll get over an hour of observing.

To this day, my best night of astronomy came Easter weekend between Merritt and Kelowna where a bathroom break turned into a 5-hour astronomy session. It was the best sky I've seen and I happened to have my Travelscope in the trunk. I can't count how many times I've done spontaneous observing by myself or with friends. I'll point to a planet, tell my friend it's Saturn, he'll bet me ten bucks it's not, I put together my telescope, and 30 seconds later he owes me ten bucks.

Recently I read an article that "point and shoot" cameras are soon to be extinct due to advancements in camera-phones. It's not that a camera-phone's quality can compete with a Canon Powershot, but the camera-phone is still good enough for what people want. A phone is better in one way: you always have it with you, and that's all that matters. The same goes for telescopes.

If you do not own a Celestron Travelscope... you should. ✸

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lustres produced glowing and interesting colours in bands. Though many were charmed, few gave much thought to certain differences in the way the colours were produced. The light of the sun gave a full rainbow standing out in colourful hues. The light of the candle showed much the same effect although, of course, it was dimmer due to the feebler light of the flame. Yet, for the observant, there is another difference. The candle makes a rainbow effect, but, near the centre of the light, in the colour yellow, sits a small copy of the image of the candle flame. Also, if someone, while watching this little yellow copy of the flame, had an assistant go and throw a pinch of table salt at the flame, the small image would suddenly become brighter and sharper. But of course nobody did this apparently pointless exercise in wasting salt. The image of the source set off from the rest of the rainbow is a portrait in the yellow lines of sodium. In other words, the signature of the element sodium is revealed in the outline of the flame whilst the other colours are blurred, overlapping and confused. The signature of the chemical elements therefore can be seen across the room from the source by the behaviour of the light. This technique had already been used to discover the chemical nature of the sun. For several years, Huggins had been directing his telescope-mounted prism to the light of first magnitude stars. He was able to see that stars that appear similar in colour also had similar chemical signatures. Using a cylindrical lens, he spread out the faint light of the star and examined the resultant rainbow for small dark lines which are the signs of an absorbing spectrum. This is a rainbow cut with dark lines. The dark lines get into the spectrum because of interactions with photons and electrons—don't worry, this isn't going to get complicated—causing the light at certain points to be absorbed and reemitted but in all directions, so that we get less of the light. The black lines are thus places in the spectrum, which are not really dark but just reduced in brightness due to scattering away from our line of sight with the source.

The dark lines match lines of specific elements. We can check up on this in the laboratory by heating the elements to incandescence and photographing the result. Here was a technique that astronomers had formerly not dreamed possible; to conduct cosmical chemistry on objects we can never bring to the laboratory.

Stars surrounded by gases in hot atmospheres make these dark-lined spectrums. But there's another possible case. Suppose a hot thin gas is lighted indirectly. The gas will lack the full spectrum that the star will produce. Instead, the black lines are replaced by bright lines in the same places and the background is dark. It's the reverse of the absorption spectrum and is called an emission spectrum. It's like the portrait of the salted flame that might have attracted viewers of the lustres had they not been busy with Victorian concerns. Here is a way of telling stars from a cloud of very thin gas. This is what Huggins saw at a glance. Unlike the full spectrum made by the stars, the Cat's Eye showed a bright line only. Huggins knew this was no collection of very faint stars awaiting some bigger telescope to resolve. The planetary nebulae are clouds of very thin gas, and thus the enigma was put to right in a moment's glance into the eyepiece.

The limitless resolvability of deep sky objects was thus refuted and astronomers came to understand that the universe contains much more than just stars. The trail of discovery started with turning the smallest glass towards objects like M44.

Binoculars reveal the Beehive as a little group of stars in the shape of an arrowhead. Eleven members are brighter than magnitude seven, so it can be resolved with the smallest glass. The cluster is flanked by two naked eye stars called donkeys while the Beehive is sometimes called a manger.

M44 is one of the nearest galactic clusters. Its large apparent size is due to its close position to the solar system (it's 600 light years away). Close inspection of the cluster shows yellow and blue stars in pleasing combinations. For larger telescopes, faint galaxies can be viewed between the stars of M44. These are background objects at huge distances. The beehive is a million times more distant than the orbit of Neptune; the galaxies peaking in amongst its stars are up to a 100,000 times more distant than M44!

M67 is a beautiful open cluster in Cancer located south of the famous Beehive cluster. It's visible in binoculars as a faint patch of light, looking a little like M44 to the naked eye, which, as you remember, in turn

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looks a little like the Hyades cluster. The difference is explained by the greater distance of M67. In a 60 mm telescope, about a dozen stars or more can be made out. M67 contains large numbers of yellow stars and is one of the oldest known open clusters.

Visually, M67 looks like M35 (in Gemini) and larger telescopes reveal more and more stars down to the limits of the instrument. Near the cluster's edge, chains of stars glisten and shift in and out of visibility offering a tantalising glimpse of many more that remain unseen.

Some report M67 can be glimpsed with the unaided eye. I have never seen this but I would not claim it's impossible. Walter Scott Houston, the *Sky & Telescope* columnist, claimed it was visible. Others have said its published magnitude of fainter than seven is much too pessimistic. Try finding the cluster in binoculars then carefully lower the glass without moving your head. Look both at the point where the object sits and all around it. I have used this technique to glimpse naked eye the galaxy in the triangle called M33, and it wasn't particularly difficult. But never, sadly, will either one be seen within the Vancouver city limits. ✸

M44 – The Beehive Cluster