POLARIS

Royal Astronomical Society of Canada
London Centre Newsletter
March 2007

Clear Sky Ramblings
Velocity

Dave Clark

At the January London Centre meeting , I presented an animation of the orbit of Comet McNaught and its day-by-day motion in the sky. A question was posed: "What speed was the comet travelling at its perihelion (closest point to the Sun)?". The silly answer that emanated from my lips was: "I don't know, but it will take only 45 minutes of programming to get an answer". I am a software development manager. I should know better. Words like this typically proceed three consecutive months of "I'm almost done!". Lo and behold, three months is probably optimistic.

To be fair, in its simplest interpretation, the speed of an object at a point in its orbit is not too difficult to calculate, as long as we don't care about the direction of that speed, and we all agree that we want to measure the speed with respect to the Sun. The quick answer for the speed of Comet McNaught at perihelion with respect to the Sun was approximately 102 km/sec.

However, things are never that easy; or more accurately, I never allow things to be that easy. First off, we never want to use simple and understandable terms like "speed". Its much more impressive to use the word "velocity", where the velocity is the change in position of the object over time. Velocity not only has a magnitude (such as 102 km/sec), but it has a direction. We call the combination of direction and magnitude the object's "velocity vector".

How do we represent or measure such a vector? Typically this is done using three numbers labelled X, Y, and Z, and we say that the object is travelling x units in the X direction, y units in the Y direction, and z units in the Z direction. Imagine yourself standing at the corner of a perfect cube. Three edges of the cube would meet at the corner near you. X, Y and Z are the directions down those three edges of the cube. But, you say, how is that cubed oriented in space, and what corner are you standing at? That depends very much on the work being done when an objects position and velocity is being discussed. It also seems to depend on the flavour of tea the astronomer is drinking the time of doing the work. In short, there are many orientations of the cube used, and my ClearSky software attempt to deal with many of them. The cube can be oriented to the Earth's equator, to the Earth's orbit around the Sun, to the Galactic plane. In any of these cases the orientation can change with time, the equatorial, orbital and galactic planes are not fixed. Therefore we attach standard dates to these orientations: the orientations at 1950, 2000, etc. Similarly, there is no firm agreement on what are the positive

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Moon Phases

March 19 2007 02:43

March 25 2007 18:16

April 2 2007 17:15

April 10 2007 18:04

Help Map Global Light Pollution

Join the World-Wide Hunt for Stars, March 8 - 21,
Five Easy Star-Hunting Steps:
1) Find your latitude and longitude.
2) Find Orion by going outside an hour after sunset
3) Match your nighttime sky to one of the magnitude charts.
4) Report your observation.
To get the magnitude charts and more instructions go to the website: **www.globe.gov/GaN**

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SHERRY

On Thursday morning the London Centre lost one of its cherished members when Sherry Hominsky passed away after her fight with cancer. Sherry was a treasure that Dave Rubenhagen quite understandably wanted to keep to himself, but his attempts failed. In the past few years, many of us met, and then grew to love this feisty life-loving lady. In every sense of the word, Sherry lived. She laughed, loved, was loved, and absolutely refused to let her problems burden others. And those eyes! One look at you and you knew: speak straight or don't speak at all. Observer's group meetings changed forever when Sherry was adopted into the clan of RASC spouses. Whenever this group met, be it at meetings, at Kelsey's, on day trips, at Home Depot nights, for lunches, dinners, or coffee at Timmy's, a party soon developed. Always, Sherry was right in the middle of it. Her friends don't speak of the quantity of time shared with her, but the quality of that time. Was it any surprise to find that her RASC chums were not the only friends that felt this way? At a recent event in Sherry's honour, we met many more folk who had obviously taken to Sherry as deeply as the rest of us. Most importantly, Sherry loved Dave, the quiet times together, and the treasured days on the water with Dave in their boat. Sherry also managed to find time to spend for herself, reading and crocheting. We have all been touched and changed forever. She will be upset with us as we cry at her passing, but will be so pleased that we laugh with our memories.

ASTRONOMY: PTOLEMY TO NEWTON

Richard L. Gibbens

The astronomer, Ptolemy, who was also the Greek King of Egypt before the Roman Empire took over that country, proposed a theory of the solar system that would be accepted as the official view of astronomy from that time on to when it was finally challenged by Nicholas Copernicus in 1543 of the Common Era. This was in spite of the fact that another Greek astronomer, Aristarchus of Samos, proposed the helio-centric theory of the solar system in which the Sun was the centre and all the other bodies revolved around it.

Why did the Ptolemaic system win out for nearly two thousand years when a helio-centric model would eliminate many of the anomalies of a geo-centric theory? It probably had to do with at least two social factors that prevailed in the Hellenistic Age and on into the Mediaeval Period. Modern Science is above all a systematic methodology for finding out how Nature works by recognising a problem, proposing testable hypotheses and checking out whether they are verified or falsified by experiment or observation. A number of Ancient Greeks used methods similar to the Modern view such as Aristarchus, Hipparchus, Archimedes of Saracuse and Galen in medicine, but these men were in a minority of opinion. Most Ancient Greek thinkers believed that reasoning from first principles and given premises would lead to the truth of how the universe worked without an appeal to empirical observation. Our contemporary science combines the practical philosophy of rationalism with empiricalism to produce the scientific method to investigate the working of natural phenomena.

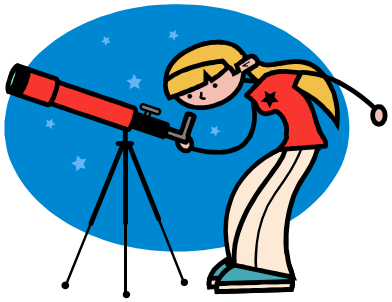
There was another reason why it is likely that the Ptolemaic view was accepted and that was the philosophical and religious climate of the Hellenistic world and later the Mediaeval Age. The helio-centric theory implied that Earth was not the centre of the universe and that the human race that lived on it was not the central species of creation. This did not sit well with people in the world of Antiquity and it was anathema to Christians who came later after the Fall of Rome. Why would God, thought Mediaeval persons, place humanity on a small body in a vast cosmos when humans were only a little lower than angels? Because of the hostile climate of the Early Modern Period by the Church, Copernicus was very careful as to how he published his revived theory of the sun-centred solar system. It was an age when saying or believing the "wrong" thing could get you burnt at the stake as what later happened to Giodorno Bruno.

However due to the later careful observations by Tycho Brahie, the helio-centric theory of the solar system started to replace the Ptolemaic model in the minds of European astronomers after the work done by Johannes Kepler and later by Galileo. Kepler came up with the laws of planetary motion which lent strong support to the Copernican theory as Kepler got rid of the "celestial spheres"; and of course the work of Galileo with the aid of the new invention, the telescope, put the capper on the helio-centric view of astronomers from then on.

Sir Isaac Newton was born the very year that Galileo died in 1642. For the next two centuries he was the greatest scientist the Western world would know. He proposed the corpuscular theory of light and invented the prism to separate white light into the colours of the rainbow, he invented the reflecting telescope which advanced greatly the science of astronomy, he discovered the laws of motion and finally he worked out his new theory of gravitation to account for how the heavenly bodies moved and remained in their orbits. After Newton, there was little controversy left in the minds of serious people that our own planet Earth was dethroned from the centre of the universe. It was a triumph for the scientific method that we use today in the fields of astronomy and astrophysics. It is idle speculation as to how history might have turned out differently if this approach to science had prevailed in the Ancient Greek world.

Sky Events for March and April 2007

March 21, **Vernal Equinox**
March 22, Mercury greatest elongation W (28°)
March 23, Moon 1° N of Pleiades (M45)
March 29, Saturn 1.2°S of Moon
April 12, Double shadow transit on Jupiter



Try to to see the Zodiacal light between March 6th to 20th in the W sky after evening twilight
Venus can be seen as a bright object in the southwest sky in the evening. Venus will be the evening "star" in the spring of 2007.

Saturn is the most prominent planet this winter, shining at magnitude 0.4 in Leo and rises at sunset
Jupiter rises an hour or so after midnight. You will have to stay up late, or get up real early, to get a good view of Jupiter

R.A.S.C. London Centre Library
Books of the Month

By Robert Duff

In order to make our library collection available to members, I bring three books to our general monthly meetings. These "Books of the Month" are available for loan, to be returned at the following monthly meeting.

The books for March 2007 are as follows:

Burnham's Celestial Handbook: an Observer's Guide to the Universe Beyond the Solar System, by Robert Burnham. Revised and Enlarged Edition. c1978.

Volume One, Andromeda—Cetus.

Looking Up: a History of the Royal Astronomical Society of Canada, by R. Peter Broughton. c1994.

A Portfolio of Lunar Drawings, by Harold Hill. 1991. (Practical Astronomy Handbooks, 1)

For a complete listing of our library collection please see our RASC London Centre Web site at:
http://www.astro.uwo.ca/~rasc/

Simply scroll down the Web page and click on library of astronomy books under the section, Benefits of Membership, or go directly to the Library Web page at: http://www.astro.uwo.ca/~rasc/Library.html

If there is a particular book or video you wish to borrow, please feel free to contact me by telephone at (519) 439-7504 or by e-mail at rduff@sympatico.ca

Sky and Telescope Subscriptions

Sky & Telescope subsriptions are available at a discounted rate through the London Centre. The cost is $39.95USD instead of the normal $49.95USD subscription rate. Please see Bill Gardner for details.

Product Review
Kestrel 4000 Personal Weather Tracker

Craig Levine

Most amateur astronomers become, by default, fairly competent amateur meteorologists. We learn to gauge wind direction, sky transparency, cloud types, humidity, etc, to predict possible observing conditions. We then take a peek at the Clear Sky Clock and the Environment Canada website to confirm or confound our weather sense. As we write our observing reports, we take note of what time equipment got dewed up, when the temperature suddenly plummeted, how the cold and wind conspired to chip away at our faces, or how a storm blew in quickly and put a damp and frenzied end to an observing session.

Many observers, including myself, also become enamored of gadgets. Gadgets for getting a precise measurement of geographic location, gadgets for controlling telescopes, gadgets that incorporate telephones with .mp3 players and pocket computers, and so on. In my continuing quest for useful gadgets, I've come across a meteorological instrument that has much utility for amateur astronomers. It's made by Nielson-Kellerman and it's called the Kestrel 4000 Personal Weather Tracker.

The unit is about the size of a cell phone, has 8 buttons on the front, a screen, an impeller (to measure wind speed), and protected external temperature and humidity sensors. Briefly, the unit will measure

* Current, Maximum and Average Wind Speeds
* Air, Water & Snow Temperature
* Wind-Chill
* Relative Humidity
* Dew point
* Heat Stress Index
* Barometric Pressure
* Altitude
* Density Altitude
* Wet Bulb Temperature

What made me go with the 4000 is that this particular model will store up to 2000 lines of data for later retrieval and download to a computer as a comma-delimited file. The information is time stamped, so if in your observing notes you note that after midnight the temperature quickly fell and the main lens rapidly got coated in dew you can pinpoint the time and environmental conditions. Even with the screen and the unit apparently off, it will collect observations at intervals that you can define: every 2 seconds to once every 12 hours. There also a snapshot button that lets you take a reading on-demand.

There are three user-defined screens that display three measurements each. For astronomy, I have one screen that shows temperature, dew point, and barometric pressure. I have the other screens set up for cold and warm weather hiking and biking. All individual measurements have their own separate screen as well. Each of those has three views: current reading; minimum/average/maximum and graphed. In graphed mode, if you press the middle button, it will display a cursor bar that you can move along the graph to get the time-stamped reading at each data collection interval.

With the optional computer interface, you can also connect the unit to a PC and display real-time measurements with 3rd party software. The company that I bought mine from included such software. The cradle for the PC interface also comes with a post that allows the unit to be mounted on any camera tripod. The unit comes with a soft pouch, but there is currently an offer that includes a sturdy case that protects the unit while leaving the external sensors exposed, and it includes a wrist strap and belt loop.

The applications for astronomy are plenty. Knowing the dew point and the barometric pressure trend are of obvious importance. Having an idea of the wind-chill is good to know, particularly if the wind is blowing off the lake and you are undecided if it's worth it to stay out a bit longer to catch an elusive faint-fuzzy. My temperature/wind-chill limit is about -22° and dropping each year! You could also set it up at an observing site over an extended period (if sufficiently hidden) to collect environmental observations over a time interval for later retrieval. The batteries will last well over 400+ days in solely data-collection mode.

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The final thing that tipped the balance that made me go with this particular unit is that it has a night-vision (NV) mode. That is, the screens backlight is much fainter than the standard model, and it has a faint reddish tinge to it. The NV model is targeted in marketing materials to primarily military and aviation audiences, though the literature also lists astronomy as one of many areas of application. The NV models come only in olive-drab. They are tough, and come with a Certificate of Conformance to indicate for government military purchase that it meets criteria for ability to withstand use under adverse environmental conditions. The Kestrel 4000 NV can be purchased for US$249, and the USB PC interface for US$69.99. Be prepared for the usurious UPS brokerage charge and sales tax if purchased from the USA. You can save the GST charge if it's purchased through your business. It can be purchased in Canada for a higher price, but with the exchange rate and UPS charges, there's very little difference.
The manufacturer's product information can be found at http://www.nkhome.com/ww/4000.html.

Tuning the LXD75 Equatorial Mount

I bought a 10 inch SN on a LXD75 mount a couple years ago. It came with dual axis drives and a computerized hand controller. It has been a lot of fun to use.
Last year I noticed there was more backlash in the axes than before. I noticed it very quickly while using the hand controller to move my telescope around while observing the Milky Way. I would reverse direction and there was a very noticeable pause before the scope started to move.

I also have an older CG4/5 mount. A few years ago I took it apart and got the old tar-like black grease out of it, cleaned it and put in nice lithium grease. What a difference that made! I also fixed the backlash on the axes. I found the information to do this at: www.astronomyboy.com. It is a great website and the instructions to fix the CG4/5 mount are great! So I decided to look around on the internet for instructions on how to disassemble the LXD75 mount. I couldn't find any, so I decided to do it on my own!

I wasn't going to take it all apart like I had the CG4/5 mount. I will leave that horrible glue like grease in the mount for the time being (if it is in there). I just want to fix the backlash. Here is what I did.
1. Remove the telescope and the dovetail bracket.
2. Remove the declination axis motor. Just one bolt to remove! You can see the worm gear now. There are two adjustments that you can make to remove backlash.
3. One of the adjustments has only to do with the worm gear. There might be play in that gear in a left-right motion. Mine didn't have any, but you need to check. I take the worm gear and try to push it left-right and feel if there is any play in it. Mine was very tight. If there is any play in it, you need to adjust it.
4. On the one end there is a lock nut and the worm gear housing has a slot in it for a screwdriver. You need to loosen the lock nut and tighten the worm gear housing just a little bit and then tighten the lock nut again.
Check for play and make sure it is not too tight by turning the gear on the other end. You will probably have to do it a few times to get it right.
Don't rush it! Take your time and do it right.
5. The other place for backlash is having the worm gear too far away from the spur gear. If you look at the worm gear, there are three bolts visible.
The outer two bolts hold the worm gear in place and the middle bolt adjusts how tight the worm gear meshes with the spur gear. This is where I had my backlash.
6. Loosen the outside two bolts and then LOOSEN the middle bolt. You read that right! If you loosen the middle bolt it lets the worm screw move toward the spur gear and make it tighter. Just move that middle bolt a little, it doesn't take much! Then tighten the outside bolts and check the backlash. I had to do mine a number of times until I got it just right. I was feeling the axis with my hands to see how much backlash there was. I would put my fingers over the space between the declination axis and the rest of the equatorial head. I would try to move the declination axis back and forth and see if I could feel any movement in my fingers. When I started I could feel a very obvious clunk-clunk as I tried to rotate the axis. When I finished I couldn't feel any movement.
7. Put the motor drive back on. There is only the one bolt and make sure you push the motor housing into the gear on the worm gear. You can introduce backlash here too if you are not careful.
8. Now take off the right ascension motor housing. Again there is just one bolt and make sure you don't take off any other bolts. I removed the two other bolts and that made things very sloppy until I noticed what I did.
9. Things are now the exact same as with the declination axis. You need to check for play in the worm gear itself and fix it first. Then you have to check for play in the worm gear meshing with the spur gear and fix that just as you did before.
10. It probably wouldn't hurt to use some Loctite on the bolts when replacing them. That way they won't come loose! Make sure you use the removeable Loctite (I think that is Loctite 242 BLUE) so you can still remove the bolts if you want to!
11. Put the motor housing back on and you are set. Again, make sure that the gears are meshed together nice and tight so there is no backlash there.
12. Time to observe!

National Council Report
First Meeting 2007

Gary Hinks, national representative

The first meeting of the year for National Council was again held in the luxurious facilities of the Council Chambers at the University of Toronto at Mississauga on Saturday, March 11. Dave Clark again provided the transportation for Peter Jedicke and myself, and I will take this opportunity to thank him again for getting us there and back so comfortably. At least the weather had finally cooperated by not giving us a blizzard to drive through!

The meeting started off as usual with a report from the executive. Here our president, Scott Young revealed that our new Secretary Stan Runge would not be attending this meeting and would be stepping down as Secretary before the GA in June. We wish Stan well, and I will miss someone who was always friendly, with a smile, who tried to make newbies like myself feel welcome at Council. Dave Lane, our 1st Vice President, then went on to make a motion that named Scotia McLeod as the Society's investment broker with signing authority given to Dave Lane, Mary Lou Whitehorne, Bonnie Bird, and treasurer Dave Clark. This motion was passed. As you may recall from last year the Society hopes to move up to 60 % of its investments over to a balanced portfolio which should help our bottom line. We then passed motions accepting the various reports of Committees and to accept new unattached members.

As usual, a very detailed report was presented to Council, by the treasurer regarding the budget for the coming year. It was shown that in the past year budget predictions had been very conservative indicating a small deficit, while in actuality, the Society had indeed been able to generate a surplus. Dave Clark showed us how many different happenings throughout the year had given us a much better bottom line than earlier predicted. He also suggested that this year we might not be as lucky. The current budget figures are indicating a nearly $35,000.00 deficit. However some of this is due to the cost of implementing over the next three years the new software system (MPA II) which will help run the Society smoother and more efficiently. Council member Randy Atwood felt that this yearly cost (approximately $17,000.00) should at least, for this first year, come from one of our Special Funds, as this is a major capital cost. Many agreed and council than passed the budget with the deficit cut approximately in half.

A report from the Constitution Committee then told us of the bylaw problems with the proposed bid for the 2009 GA to be held in August at the SSSP. One way around the problem would be to have the Annual Meeting held sometime in the spring and still have all the other activities continue in the late summer at the GA. As many have said, it would really be nice to actually do some astronomy (observing) at a GA-especially from a very dark sky site. The Committee will look further into being able (hopefully) to make things work. The Committee also presented motions to except new Centre bylaws from the St. John's Centre and the newly named New Brunswick Centre (formally Moncton).

From the Membership and Promotion Committee, a motion was put forward for Council to allow the Committee to go ahead and investigate the creation of a National Speaker's Bureau program and presentation resource exchange for Centres. This list would appear on the national web site and hopefully would help Centres in finding guest speakers and other resources for their own meetings. The MAP Committee also presented a new product proposal to Council. This may be a new publication for the Society. The book, Warren Finley's Concise Catalogue of Deep Sky Objects has already received the Simon Newcomb award from the RASC. This book has all the Messier, finest NGC, and Herschel 400 objects listed with a detailed description of each

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and negative directions and which edge of the cube is X, Y or Z. In other words, at what corner of the cube are we are standing? Although this all seems rather horrible, the mathematics to transform a velocity from one XYZ orientation to another is very manageable. But, it takes far more than a few minutes to implement in a program.

Had enough? I'm not done. We live on a spherical ball. When we look up, we see the sky as the inside of another huge spherical ball. We naturally begin to measure positions of celestial objects not by X, Y, and Z, but by how high up and how far over the object is on the ball. And to represent how far away an object is, we have to concern ourselves with the size (or radius) of the ball. So now, rather than X, Y and Z, we represent a position by a distance R (the radius of the ball), and two angles, omega and theta (Greek letters; alphabetic letters would be too easy). Similarly, velocity is represented by the change in R, theta, and omega over time. And how is the ball oriented? It is tilted and centred in as many ways as our cube above. So that we can talk about coordinate systems easily, we call XYZ systems "Cartesian" coordinate systems, and R-omega-theta systems "polar" coordinate systems. Again ClearSky tries to handle them all. Transforming positions and velocities between Cartesian and Polar systems is a little more mind-bending than transforming between different Cartesian systems and transforming between different polar systems. The real pain comes from the fact that the transformations of the velocity change with the position of the object. There are some real benefits to using polar systems to represent velocity. The R component of the velocity is the rate at which the object is approaching or receding from us. Depending on the orientation of the system, the angle omega and theta can give us apparent motion along or towards the horizon, orbit plane, galactic plane, etc. A combination of the two angles omega and theta give us the apparent motion of the object in the sky.

So, how long will it take for ClearSky to completely report the "speed" of an object? Oh, about a "few" months.

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object. It is hoped in the new publication to add perhaps spaces to check off and sketch each object-thus allowing the book to show your own progress throughout its lifetime of use. A motion for MAP to complete the detailed work of contracting, research, and estimation, with the intention of presenting the complete proposal at the next Council meeting in Calgary was passed. Having looked at the current book-the new version with some suggested revisions (it may also be spiral bound) should be a very attractive product. A possible suggested RASC member price would be $24.95.

An update was given to Council on the proposed 2008 GA. The hosts include the Toronto Centre, the Mississauga Centre, and the Hamilton Centre. Respectively, these Centre's are the oldest, the youngest, and a Centre celebrating it's centennial (2008). The proposal is also sponsored by the Department of Physics and Astronomy at York University, which will also be the venue for the event. It will be planned for the Canada Day long weekend. A motion was passed by Council accepting their proposal.

Finally, Council passed a motion creating a committee that will look into the logistics of the RASC starting an astroimaging certificate. This may be similar to our observing certificates, but also, obviously, would have to satisfy different criteria. Such a program would hopefully be able to, as suggested by its creators, give recognition to both beginners and advanced members. More information will be forthcoming at the next meeting of Council.