

AURORA

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The Royal Astronomical Society of Canada - Windsor Centre

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The Solar Wind and the IMF by Bert Huneault

IMF?... No, I'm not talking about the International Monetary Fund which we often hear about in economic and financial news. The **IMF** we're concerned with here is the **Interplanetary Magnetic Field**.

The Sun is a giant magnet. Just like a bar magnet, it has a magnetic north pole and a magnetic south pole, and field lines looping between the poles. Such a magnetic field is called a dipole. What's peculiar about the solar magnet, however, is that its polarity reverses every eleven years. As a matter of fact, in the Sun's northern hemisphere the magnetic pole was a north pole during the decade ending in 2000 - 2001, but it flipped to a south pole over a year ago. This topsy-turvy situation was not unexpected because the magnetic poles always exchange places at the peak of the solar cycle; thus the latest flip-flop which occurred in 2001, was at the height of solar cycle 23. So, until the next solar max in another decade or so, the Sun's northern hemisphere will continue to host a magnetic south pole!

During years of maximum solar activity, the Sun's surface is peppered with spots possessing magnetic fields hundreds of times stronger than the normal dipolar field. These numerous and intense sunspot fields overwhelm the underlying magnetic dipole. As a result the magnetic field near the surface of the Sun becomes tangled, twisted and complicated.

The Sun's magnetic field is not limited to the immediate vicinity of our star; the solar wind carries it throughout the solar system. Out among the planets, the Sun's magnetic field is called the **Interplanetary Magnetic Field (IMF)**. An important part of the IMF is its B_z component, which is aligned with the Earth's magnetic axis.

The Earth's magnetic field forms a bubble around our planet. Called the magnetosphere, this envelope deflects solar wind gusts. The magnetopause is the region where the IMF comes into contact with the magnetosphere, i.e. where the solar wind meets the Earth's magnetic field.

Earth's magnetic field points north at the magnetopause; but B_z can point either north or south, depending on the magnetic property of the solar wind at that moment. If the IMF points south - - i.e. a southward B_z - - then it can partially cancel the Earth's magnetic field at the point of contact, opening a door through which energy from the solar wind can reach Earth's atmosphere. Thus a strong southward B_z often heralds widespread aurorae triggered by solar wind gusts or coronal mass ejections that are able to inject magnetic and particle energy into our planet's magnetosphere, thereby creating geomagnetic storms. These disturbances can affect radio communications, atmospheric drag on satellites, auroral activity, power grids on Earth, and even the safety of astronauts in Earth orbit. To sum up, then, it's the strength and orientation of the IMF which can cause temporary disturbances (storms) in our planet's magnetic field.

The strength of the IMF near planet Earth is monitored by satellites, and is measured in nanoTesla units (nT). The IMF is a weak field, varying in strength near the Earth from 1 to nearly 50 nT, with an average value of approximately 6 nT.

With the Internet you can keep tabs on the ever-changing strength and polarity of the IMF by scrolling down the left frame at www.spaceweather.com; or by examining the yellow B_z graph at www.sec.noaa.gov/ace/MAG_24h.html; or by observing the neat and colourful display at www.sec.noaa.gov/SWN/sw_dials.gif which, in addition to a B_z dial, includes a **speed** dial that indicates the velocity of the solar wind (in km/s), and a third dial showing the **pressure** (in nanoPascals) resulting from the speed and particle density of the solar wind. Positive values of B_z indicate north polarity; negative values, south polarity. The data, from NASA's ACE satellite, are shown virtually in real time because the dials are updated every 5 minutes.

Hoping to see aurora borealis?... Just remember that an intense B_z with south polarity is what

(Continued on page 3)

In This Issue

The Solar Wind and the IMF	Cover & Page 3
Calendar of Events / Maps / Submitting Articles / Membership	Page 2
A Message from the President	Page 3
Pluto's Warming Wisps	Page 3
A Double Star's Planet	Page 4 & 5
Proposed Nomination List for 2003 Council	Page 4
September Meeting Minutes	Page 6

Calendar of Events

Our next meeting...

Tuesday, November 19, 2002
8:00 p.m.
at
St. Stephen's Church
Howard Road, 1.4 kms. south of
Hwy # 3

Main Speaker...

Dr. William Baylis

Topic...

“Galileo and *The Starry Messenger*”

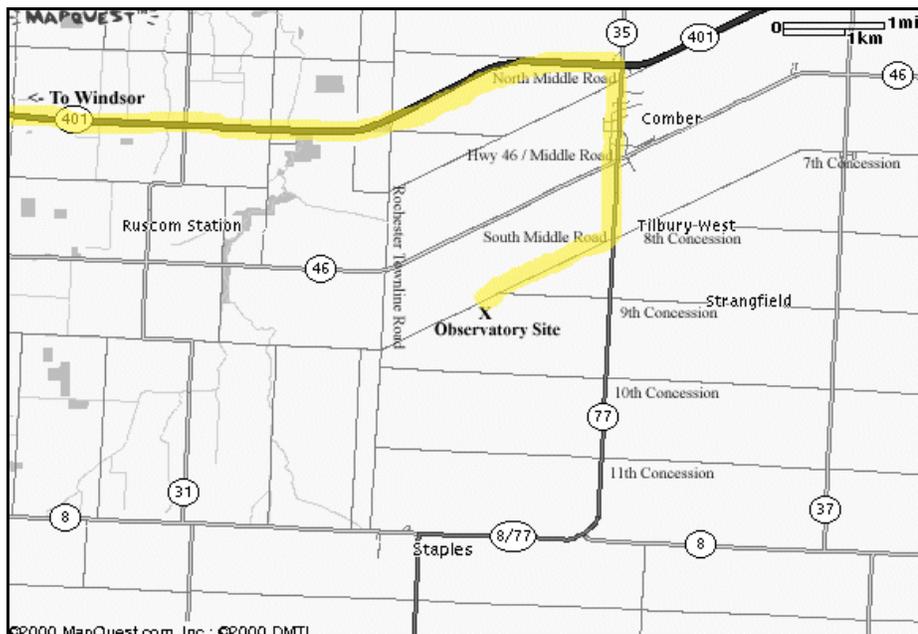
Activities...

Jupiter's Moons: On October 17th Jupiter's Moon Europa will partially occult Io from 5:38 - 5:42 a.m. EDT

Orionid Meteor Shower: Look for the Orionids to peak in the predawn hours of October 21st. The full Moon interferes with these fast meteors this year so begin your watch earlier in the month.

Leonid Meteor Storm: Come join members of the Windsor Centre at the Hallam Observatory site the night of Monday November 18 through sunrise on the morning of 19th. The best view should be from 5:00 - 6:00 a.m. on the morning of the 19th. See page 5 for more details.

Council Meeting: A short council meeting will be held on Tuesday November 26th at 7:30 p.m. at Randy's house.



Hallam Observatory Site

At left is a map showing the Comber area and it includes the major highways (401, 77, 8 and 46) that are in the area of the observatory. I "highlighted" the most direct route from Windsor on this map which is to take 401 East to Highway 77 South to South Middle Road. While on South Middle Road you will cross some railroad tracks (they just removed the tracks) and just after the barely discernable point where Concession 9 joins it you will find the observatory site on the South side of the road. If you hit the Rochester Townline Road (i.e. you come to a stop sign and have to turn left or right) you have gone too far. On most clear nights someone is usually out there observing but if it happens to be a clear, moonless, weekend night you should have many observing buddies.

Submissions

Aurora is published monthly except for August. The September, November, January, March, May and July issues are full newsletters (usually 6 pages) with a number of member submitted articles. The October, December, February, April and June issues are short flyers (2 pages) with one short article. 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. I will accept Emails at the address below, floppy disks, or written submissions.

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 St. Stephen's church. 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, the RASC Journal, a subscription to SkyNews magazine and access to the Centre's library and telescopes.

Annual Membership Fees are Regular - \$44.00, Youth - \$27.50 and Life - \$880.00.

Contact Ken Garber at (519) 966-3478 or visit our website at: www.mnsi.net/~rasc for more information.

A Message from the President

After many months of hard work, we were advised by Trillium Foundation that our grant application for a 14" Telescope to be installed in Hallam Observatory, was approved.

We will be handling some paperwork with Trillium in the near future, and expect that it won't be too long before the order is placed for the instrument. Software Bisque is the company that had been chosen to supply the Celestron 14" Schmidt-Cassegrain optical tube assembly, to be mated to their very superior "Paramount" German equatorial mounting. This combination will represent a world-class, state-of-the-art setup for viewing and photography.

And, of course, it will provide an excellent centre for education and popularization of astronomy. The Comber site seems to be settling in as a place of choice for many members, for their dark-

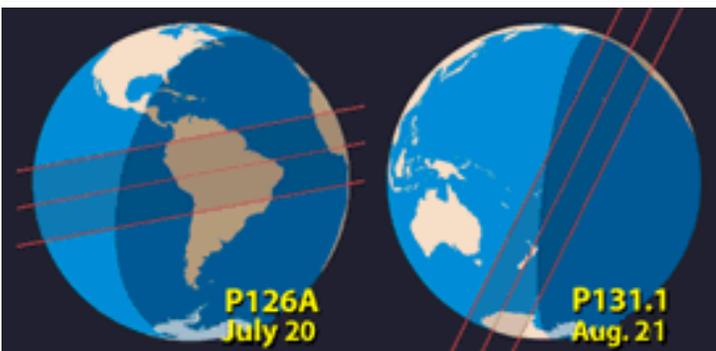
sky observing. Windsor Centre members can obtain full access to the observatory facility for a fee of \$40.00/year. Those who wish to use just the grounds around the building for viewing are asked to consider a voluntary site access fee of \$10.00/year for this purpose.

Several have already paid for these usages. Interestingly, those indicating observatory access are out-pacing those with an interest only in site access, by a ratio of about two to one.

Funds collected from these fees are being used towards the annual cost of maintaining the building and site.

Randy Groundwater

Pluto's Warming Wisps By J. Kelly Beatty from Sky and Telescopes Website



The view of Earth from Pluto's perspective during the little planet's two occultations in mid-2002. July's track over South America barely missed several large observatories, while the August event could be viewed by large telescopes in Hawaii, California, and Arizona. S&T: Steven Simpson (source: J. Elliot/MIT).

October 10, 2002 Distant Pluto has been traveling farther from the Sun since its 1989 perihelion, and astronomers worry that the diminishing sunlight will cause what little atmosphere the planet has to "collapse" as frost onto its surface. But for now, at least, Pluto seems to be holding its own. Results from a pair of recent stellar cover-ups suggest that the planet's atmospheric pressure has nearly tripled during the past 14 years and that the surface temperature increased some 2° Celsius during that timespan.

"It's very obvious that there's been a fundamental change," observes Marc W. Buie (Lowell Observatory), who was among those presenting Pluto results at a meeting of the American Astronomical Society's Division for Planetary Sciences.

The exact cause for the warming remains unclear. There's some

evidence that Pluto's icy surface has become darker overall in recent years, allowing it to absorb more of the weak sunlight and drive more gas into the atmosphere. Alternately, a frost layer near the north pole (now experiencing its spring season) may be sublimating more vigorously. David J. Tholen (University of Hawaii) thinks that the planet's surface is only now reaching its peak warmth after passing through perihelion. "The hottest part of the day on Earth is usually around 2 or 3 p.m., rather than noon," he explains.

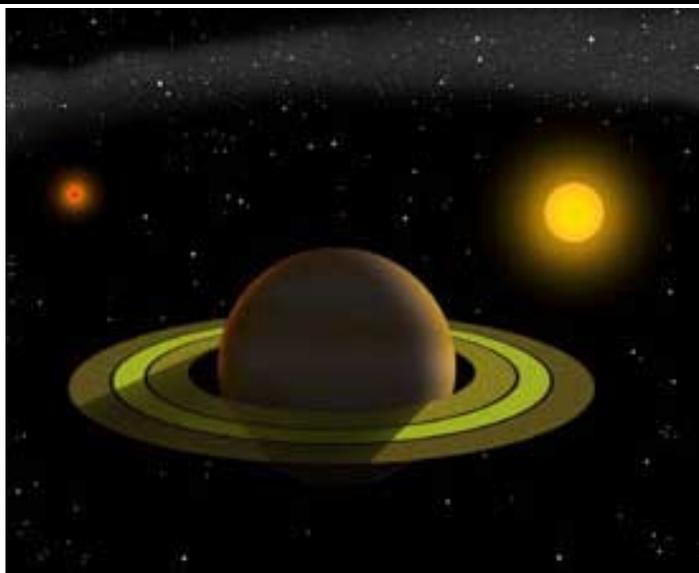
The only other record of Pluto occulting a star, in June 1988, revealed that the diminutive planet has a thin nitrogen atmosphere laced with trace amounts of methane and carbon dioxide. Astronomers waited patiently for another such opportunity, and by chance the distant planet passed over two stars in a five-week period. The first event, on July 20th (Universal Time), had a path that crossed central South America — yet it was recorded by only two portable telescopes in extreme northern Chile. However, on August 20th Pluto's shadow passed directly over the array of observatories atop Mauna Kea and Haleakala in Hawaii. This event was also seen by observers at Lick and Palomar observatories in California and at Lowell in Arizona.

Two large research teams, led by James L. Elliot (MIT) and Bruno Sicardy (Paris Observatory), mounted observing campaigns for this year's events. They agree that the atmospheric pressure has jumped but remain divided on whether the wispy air mass has the same basic structure seen 14 years ago, or whether new features have appeared. Elliot notes that Pluto's case bears similarities to the situation on like-sized Triton, Neptune's largest moon, whose thin atmosphere has also warmed in recent years. But months of tedious analysis remains before the light curves' subtle bumps and squiggles can be fully understood.

The Solar Wind and the IMF

(Continued from page 1)

you're looking for. You might also check the Space Environment Center's auroral oval at <http://www.sec.noaa.gov/pmap/pmapN.html>. If the yellow, orange or especially the red portion of the oval ever extends southward as far as the Great Lakes on the map, look for aurorae! That's precisely how I was alerted to the wonderful auroral display on the evening of November 5, 2001.



This artist's conception illustrates the scene around the Gamma Cephei binary star system. Astronomers have found evidence for a planet orbiting the yellow star on the right every 2.5 years. The discovery makes this the first planet ever found in a binary system. Courtesy Tim Jones/McDonald Observatory.

October 14, 2002 Can planets exist in a double-star system? This fascinating question, as old as science fiction, now has a clear answer. Gamma Cephei, a naked-eye star not far from Polaris, has a dim dwarf companion star in a roughly 70-year orbit and also a giant planet in a 2.47-year orbit, say Artie Hatzes (Thüringer Landessternwarte, Tautenburg, Germany), William D. Cochran (University of Texas), and other members of the McDonald Observatory Planet Search Team.

The McDonald group is monitoring about 180 stars for tiny wobbles in their radial (line-of-sight) velocities, the telltale sign of an orbiting planet. In the case of Gamma Cephei, good radial-velocity measurements go as far back as 1980. They show a huge, slow wobble indicating a companion star with at least 0.4 times the mass of the Sun (at least 400 Jupiters' worth) in a decades-long orbit that carries it from about 12 to 30 astronomical units from Gamma itself. These are about the distances of Saturn and Neptune from the Sun. The companion star is too dim to have yet been seen in telescopes; it's probably a red dwarf.

Buried deeper in the radial-velocity data is a slight — but persistent and very regular — oscillation with a period of 2.47 years. Since 1989 astronomers have suspected that an orbiting planet might be the cause, but now the McDonald team says it has a long enough run of measurements to be sure. They say the wobble indicates a body with at least 1.8 Jupiter masses swinging in a mildly elliptical orbit that car-

Proposed Nomination List for 2003 Council of the RASC - Windsor Centre

Elected Officers

President	Randy Groundwater
1st Vice-President	Steve Mastellotto
2nd Vice-President	Robin Smallwood
Treasurer	Ken Garber
Secretary	Joady Ulrich
National Council Rep.	

Councilors

Paul Preney	Susan Sawyer-Beaulieu
Henry Lee	Steve Pellarin
Peter Bondy	Rev. Harry Brydon
Tom Sharron	Ken Roung

Appointed Officers

Honorary President	Dr. William Baylis
Past-President	Susan Sawyer-Beaulieu
Librarian	Tom Sharron
Recording Secretary	Dave Panton
Public Education Director	Randy Groundwater
Public Relations Director	2nd Vice-President
Newsletter Editor	Steve Mastellotto
Assistant Newsletter Editor	Paul Preney
Director of Observing	Steve Pellarin
Assistant D. of O.	Robin Smallwood
Alternate Council Rep.	
Webmaster	Steve Mastellotto

ries it 1.7 to 2.5 a.u. from the bright star. This is about the distance of the asteroid belt from the Sun.

Gamma Cephei, shining at 3rd magnitude, is the brightest of the approximately 87 stars that have been found to have one or more planets. Located 45 light-years away, it's a yellow-orange subgiant of spectral type K1 IV blazing 12 times brighter than the Sun. Its mass is estimated at 1.6 Suns, it is beginning to expand and enlarge toward becoming a red giant.

A Double Star's Planet

(Continued from page 4)

Its red-dwarf companion star is probably so dim that it shines on the planet's night side with only a few times the brightness of the full Moon on Earth.

The find is really no great surprise. Astronomers have long known that a planet could maintain a safe, stable orbit in a binary system if it circles several times closer to one star than the other star ever ventures. But whether planets can *form* in such an environment has been more speculative. In their announcement paper, Hatzes, Cochran and their colleagues write that the Gamma Cephei planet "should provide an interesting case study for understanding how binary stars influence the planet-formation process."

Planets have been found orbiting other stars in binaries, but in those cases the two stars are dozens of times farther apart and live quite independently.

For Sale

8 inch telescope on an equatorial mount with enhanced coatings on custom mirrors, JMI focuser, telrad and remote power supply. Asking \$1,300. Call Ken Rong at 738-3479.

Leonids 2002

A few years ago the thought of being able to predict when a meteor shower would peak let alone storm like the Leonids was unheard of. In the past few years a number of researchers have been building models of the debris left by Comet 55P/Temple-Tuttle which is the parent comet of the Leonid meteor shower and their predictions have become quite accurate (to within a couple of minutes). Still the maximum number of meteors is less predictable and the type (lots of fireballs or many faint meteors) is even less predictable.

This year we once again pass through the ribbons of material left by Temple-Tuttle during its 1767 and 1866 passes so researchers are very confident about what we can expect to see. At approximately 4:03 UT on November 19th (11:03 p.m. EST on the night of November 18th) we will pass through the 1767 trail and should experience a storm of approximately 3,500 meteors per hour. This storm will be best viewed from western Africa and western Europe. At 10:40 UT on November 19th (5:40 a.m. EST on the morning of November 19th) North America will experience a storm of 2,600 meteors per hour as we pass through the 1866 trail.

Although the Full Moon will interfere with the viewing of faint meteors it will be setting in the west when the peak of activity is nearly overhead and you should not miss this opportunity if the sky is clear. Your next chance to view a Leonid storm will be in 2098!

UNIVERSAL SCIENCE

Windsor's Astronomy And More Store

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Used Meade Pictor autoguider and Meade autofocuser. Contact Robin for email address of current owner.

Contact Robin Smallwood
Telephone: (519) 967-1655
Email: unisci@sympatico.ca

September Meeting Minutes

General Meeting Minutes

September 17, 2002

President, Randy Groundwater: Randy opened the meeting and requested and received a motion to accept the minutes from the June meeting. Moved by John Welsh, seconded by Rob Hastings Trew and the motion was carried.

Reports

Correspondence Secretary, Joady Ulrich: Joady reported he had written to the president of RASC and requested they send a speaker for one of our regular meetings.

Treasurer, Frank Shepley and Assistant, Ken Garber: Frank announced he had the 2003 RASC observing calendars on hand for sale at a \$3 savings for \$12. He also noted he would be accepting payment for the annual \$10 voluntary site fee or the mandatory \$40 observatory/warm room access fee for the Hallam Observatory which are both effective October 1st.

Having served as treasurer for six years Frank will resign and be replaced by Ken Garber. Three new members joined this evening. Mr. Fortier and Wilson paid adult memberships and one Junior membership went to Jay Gibbs.

National Council Representative, Tim Bennett: Tim was unable to attend tonight's meeting.

Librarian, Tom Sharron: All book loans are in order and two telescopes are currently out on loan.

Newsletter Editor, Steve Mastellotto: Steve will serve his last term as editor this year and a new editor will be needed. Steve will train his successor in the computer publishing program he uses to produce the current excellent newsletter.

Steve also asked those who may not have received a meeting reminder e-mail or phone call to check with him to be certain their names are on his list.

Public Relations Director, Robin Smallwood: Robin was unable to attend the meeting.

New Business

Trillium Fund Application: Peter Bondy gave a report on the status of our Trillium Foundation application for funds to purchase a telescope and mount.

The application process has been complex and time consuming with need for all manner of paperwork documentation including a last minute financial report done by Peter, Frank Shepley and Joe Cambala. The application was favourably

received and there was a site visit during an observing session done by the local representative.

No news is expected until the application has been reviewed by the Board in Toronto. September 27th is the earliest date an official announcement can be made.

Should we receive the funds it will take as long as 6 to 8 months before the telescope and mount are shipped to us.

Winery Night: The Pelee Island Winery wine tasting and astronomy night organized by Robin was a success and could bring in \$500 for the club.

Observing Chair: Mike Pataky displayed an impressive adjustable height observing chair he designed and built from maple dowelling. He offered to build more and sell them to members at a discounted price.

From the Floor: Susan gave a brief report about attending Starfest in Mount Forest. She had acquired a set of small Teflon buttons to be used in the new 8 inch club Dobsonian telescope currently under construction.

50/50 draw: The draw was won by Rod Clark.

Speakers

Shadowgram: Randy showed a series of color slides going back into the long history of Windsor Centre.

Hallam Observatory Dedication: Steve Mastellotto showed a collection of photographs taken at the June 15th annual picnic and dedication ceremony. Mrs. Cyril Hallam was able to attend and cut the ribbon naming the observatory in memory of her late husband Cyril Hallam, Windsor Centre founder.

Director of Observing: Steve Pellarin filled in for Robin Smallwood and first asked for reports of observing sessions held during the summer months. A number were made from the floor including summer meteor showers, observations of comet Hoenig, Pluto, the partial solar eclipse of June 10th and seeing asteroid 2002 NY40 whiz through our Earthly neighbourhood in space. He then gave a thorough review of astronomical sights to be seen in the next month or two.

Meeting adjourned 10:15 p.m.

David J. Panton
Recording Secretary