

AURORA



Volume 27, Number 11

The Royal Astronomical Society of Canada - Windsor Centre

July 2002

The ABCs of Infrared and Ultraviolet Light by Bert Huneault

The electromagnetic (EM) spectrum comprises all the various types of radiation, including radio waves, microwaves, infrared light, visible light, ultraviolet light, x-rays and gamma-rays, in decreasing order of wavelength (increasing order of frequency).

Although all of these electromagnetic waves are useful in astronomy, this article is only concerned with wavelengths immediately adjacent to the visible part of the EM spectrum, i.e. infrared light (IR) and ultraviolet light (UV).

In this day and age, we often encounter terminology such as “UV-A” and “UV-B”, “near infrared”, “extreme ultraviolet”, “long-wave IR”, etc. Assigning numbers to the wavelengths of visible light as well as to those adjacent to the optical spectrum should enable readers to put these terms in proper perspective.

In this part of the EM spectrum, wavelengths are commonly stated in nanometres (nm) - - one nanometre = one billionth of a metre - - although other units are sometimes used such as millimetres, micrometres and Angstrom units. We'll use nanometres. Visible light has wavelengths between about 400 and 700 nm, corresponding to violet and red light, respectively.

INFRARED LIGHT

All objects continually emit radiant energy in a mixture of wavelengths. Objects at low temperatures emit long waves, while higher-temperature objects emit shorter waves. Shorter-wavelength IR waves (e.g. from the Sun, or from a campfire) absorbed by our skin produce the sensation of heat; so IR is commonly referred to as “heat radiation”. Infrared radiation is the section of the EM spectrum extending from the red end of the visible spectrum (700 nm) to the microwave region (1,000,000 nm).

“Near infrared”, sometimes called IR-A, refers to wavelengths immediately adjacent to the optical spectrum, from about 700 to 2500 nm. “Intermediate infrared”, sometimes called IR-B, comprises wavelengths between 2500 and 50,000 nm. “Far infrared”, sometimes called IR-C, refers to wavelengths between 50,000 nm and 1,000,000 nm (1 millimetre).

The atmosphere is transparent to much of the near infrared, although some wavelengths longer than 800 nm are absorbed by water vapour. The near IR can be detected photoelectrically and its shorter wavelengths can be photographed with certain types of emulsions. Thus the near IR is sort of an extension of the optical window to longer wavelengths.

In astronomy, infrared light can be used to map interstellar dust. The energy of starlight absorbed by interstellar dust heats it; in turn, the heated dust emits IR radiation. An IR image of the Orion region, for example, is very different from that obtained by optical telescopes, because it shows the dust content and not the stars.

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Calendar of Events

Our next meeting...

Tuesday, September 17, 2002
8:00 p.m.
at
St. Stephen's Church
Howard Road, 1.4 kms. south of
Hwy # 3

Main Speaker...

To Be Announced

Topic...

"To Be Announced"

Activities...

Summer Solstice: Summer officially begins on June 21 at 9:24 a.m. E.D.T.

Mercury and Saturn Conjunction: On the morning of July 2 look for Mercury and Saturn in the morning sky just 16 arc minutes apart (that is less than half the diameter of the full Moon).

Gateway to the Universe Star Party: July 12 - 14 at the Munro Family Campground in Powassan, Ontario (near North Bay).

Starfest 2002: August 8 - 11 at the River Place Campground near Mount Forest, Ontario.

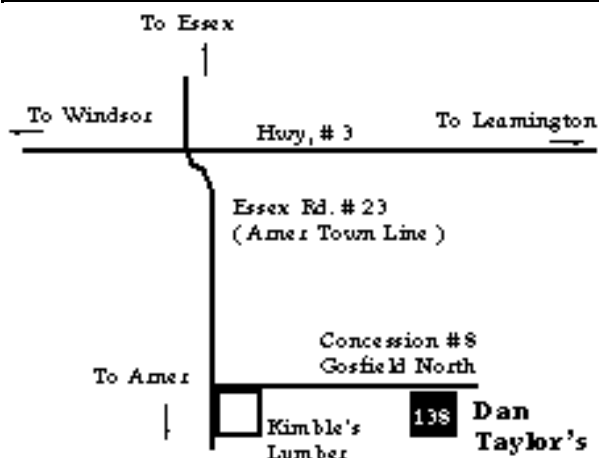
Pelee Island Winery: Saturday August 10 is the night the Windsor Centre teams up with the folks from the Pelee Island Winery for an evening of wine and cheese and stargazing.

Perseid Meteor Shower: The Perseids peak on the night of Monday August 12 and with the Moon half way between New and First Quarter we should get a good show this year.

Great Manitou Star Party: Gordon's Park & Carter Bay Resort on Manitoulin Island, Ontario

Huronian Star Party: On a private campground on the Kueper farm northwest of Alliston, Ontario.

Maps



Observing Nights

Frank Shepley's.....Last Quarter Moon
Dan Taylor's.....New Moon

(please call before showing up)

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: smastell@wincom.net

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. Stephan'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 Frank Shepley at (519) 839-5934 or visit our website at: www.mnsi.net/~rasc for more information.

ABCs of IR and UV Light (continued)

(Continued from page 1)

In weather-satellite imagery, different wavelengths provide meteorologists with valuable information on the atmosphere below. Visible light with a wavelength of 650 nm (channel 1) responds to the albedo of clouds. Intermediate IR with a wavelength of 6700 nm (channel 3) shows the water vapour content of the atmosphere. Longer-wave IR of 10,700 nm (channel 4) reveals the temperatures of clouds, land and sea surfaces. Colder temperatures result in whiter images; thus very bright images correspond to high-altitude (cold) clouds.

ULTRAVIOLET LIGHT

Ultraviolet radiation is the section of the EM spectrum extending from the violet end of the visible spectrum (400 nm) to the x-ray region (10 nm). It includes the Sun's burning rays and is subdivided into three distinct wavelength regions: UV-A, UV-B and UV-C. UV-A ranges in wavelength from 400 to 315 nm; UV-B from 315 to 280 nm; and UV-C includes wavelengths shorter than 280 nm. UV-A is the weakest form; it causes skin aging and wrinkles. UV-B is stronger than UV-A and causes skin cancer and cataracts. Both UV-A and UV-B cause suntans and sunburns. UV-C, which is even stronger than UV-B, is fortunately absorbed in the atmosphere, primarily by ozone, and does not reach the ground.

The atmosphere is completely opaque to EM radiation shorter than about 300 nm. Therefore astronomers studying the universe in UV light generally depend on observations taken above the Earth's atmosphere, such as from orbiting solar platforms like the Solar and Heliospheric Observatory (SOHO) or orbiting astronomical observatories such as the Hubble Space Telescope (HST). Incidentally, in addition to taking UV pictures, the HST also takes near-IR pictures.

INTERNET URLs

For readers with access to the Internet, excellent solar images are available in different wavelengths at <http://umbra.gsfc.nasa.gov/images/latest.html> and excellent, interactive, current weather satellite images in both visible and IR light are available from <http://www.ghec.msfc.nasa.gov/GOES/goes8conus.html>

Atomic Time by Bert Huneault

On Christmas day, 2000, my wife gave me a wonderful present, perfect for amateur astronomers: a "Sync-Time" atomic wrist watch. The watch's extraordinary accuracy is maintained by time signals broadcast by long-wave radio station WWVB. This station, located in Fort Collins, Colorado, is run by the National Institute of Science and Technology (NIST) which operates the U.S. Atomic Clock. Its 50,000-watt transmitter sends out synchronizing radio signals on a frequency of 60 kHz. Because this is a long-wave signal, its reception is dependable throughout North America and even abroad, unlike WWV's short-wave signals which are prone to fading due to solar effects on the ionosphere.

To intercept the synchronizing signals, the wrist watch has a built-in miniature antenna and radio receiver tuned to 60 kHz. The watch is thus synchronized to the U.S. Atomic Clock (which measures each second of time as 9,192,631,770 vibrations of a cesium-133 atom in a vacuum) and gives Official U.S. time which is accurate to 1 second every million years. The timepiece even accounts automatically for daylight saving time, leap years, and leap seconds; it also shows the date on command. Battery life is approximately three years.

Although there is no need to periodically check the accuracy of the watch, I occasionally do so out of curiosity by listening to short-wave signals from WWV or CHU, or National Research Council time signals broadcast at 1:00 pm on AM radio station CBE. When I do, it's always reassuring to see the sweep-second hand reach the zero mark at the top of the dial at precisely the instant marking the beginning of the time signal's beep. This kind of accuracy is ideal for amateur astronomers observing time-sensitive events such as transits and occultations.

The watch manufacturer, "ATOMIC TIME", located in Illinois, also markets similarly radio-controlled clocks and clock radios. Further information is available at the company's URL which is www.radiocontrolledclock.com. The website displays the various clocks and watches, including my Sync-Time wrist watch, model AAWA103.

Member Notes: "Astronomy from a reclaimed garbage dump" from Dave Panton, From the top of Malden Park Hill, Tom Sobocan and I were very fortunate to witness the June 10th eclipse neither of us thought would be possible. Using the Observer's Handbook and my "Starry Night Pro" program we figured if we saw anything we would be very lucky as we were so far east and sunset was approaching to cut off the event. We lugged Tom's 6 inch Dobsonian, sun filters and so on to the top of the bobsled hill and setup by 7:30 p.m. We used a discarded beer case to support his scope on the sloping path outside the fence.

As the sun slipped down into banks of clouds we figured we were "done for". We both commented "If you don't try you'll never succeed". Darned if the cloud bank didn't have occasional gaps. The murk over Detroit obscured what little sunlight broke through now and then. We nearly packed it in a couple of times but hung in.

Voila!! at 8:45 p.m. a wounded sun glowed dull orange through the muck. It had a small bite out of the lower edge. Over a fifteen minute period the moon bite slid along the sun, clearly visible whenever cloud coverage gaps flowed by. By 9:05 there was little to see and the sun was swallowed in dense cloud.

Only one other person was on hand, a computer programmer had come to see the sight. After he left a young couple casually walking by stopped out of curiosity (No Wonder). We were able to show them the last tiny piece taken from the sun's disc by the moon. Both had no idea what was happening and asked many excellent questions.

It wasn't much of a view but it was all ours. Isn't that what amateur astronomy is all about?

May Meeting Minutes by Dave Panton

General Meeting Minutes May 21, 2002

President, Randy Groundwater: Randy opened the meeting and requested and received a motion to accept the minutes from the April meeting. A correction was needed. Jean Langan's passing was noted by contributions in her memory totaling \$60. Henry Lee moved for acceptance and Susan Sawyer-Beaulieu seconded, motion carried.

Reports

Correspondence Secretary Joady Ulrich: Joady was unable to attend the meeting.

Treasurer Frank Shepley and assistant Ken Garber: Frank announced that membership cards since January were signed and on hand for pickup.

The club internet account is due and Frank asked for a "sponsored by" donor to cover the \$66 needed each six months. Until his passing, Dave Marchand had paid for it on his own volition.

The dome project is now insured and the bill is expected shortly.

National Council Representative Tim Bennett: Tim gave a brief report of his attendance at the Annual General meeting in Montreal. The fee decoupling proposal was defeated. A total of 15 presentations were given on a variety of topics. The GA will be held next year in Vancouver. There were suggestions to have a GA in Windsor. Members can check the RASC website to see photos taken at the GA. Tim will give more detail at our next regular meeting.

Newsletter Editor Steve Mastellotto: Steve has prepared a new phone committee list. He has also added more photographs to the club website.

Public Relations, Robin Smallwood: Robin was absent.

Susan reported four recent successful events.

Event #1: The Club set up a display under a tent on rainy "Earth Day" in Ojibway Park. Lots of people showed interest as they passed by the various exhibits. Susan thanked all who participated and also visited.

Event #2 (and #3): A "Planet Watch" Public Observing Session was set up to see five planets in the evening sky on May 5th. Via fortunate happenstance we wound up with one event at two locations instead of one. At Malden Park about fifty visitors had come specifically to see the planets. Along the Detroit River at the Sculpture Gardens there was a mix, some had come for the event while larger numbers of passers by joined in, forming long lines at telescopes. Ten telescopes were split between the locations and all kept busy until late in the evening.

Event #4 A teenage "Out of this World" party at the Leamington dock park by a church group was held on May 11th but the sky was obscured. Susan and Robin prepared an astronomical slide show and did an indoor presentation. Martha Pinch thanked Robin and Susan as well as volunteers who had offered to set up telescopes. She then presented a donation.

Director of Observing Robin Smallwood: Robin was unable to attend so Steve Pellarin filled in for him with a review of the waning five planet display and encouragement to try for Uranus, Neptune and tiny Pluto currently just barely visible under the right conditions with an 8 inch or larger telescope. Comet Ikeya Zhang is another target but is rapidly dimming on departure.

Steve also asked for assistance from members with telescopes. They can join him and his Brennan High School Astronomy Club members Friday May 24th at dusk on their athletic field.

Librarian Tom Sharron: Tom reported the results of the silent auction held last month had disposed of several duplicate copies of books. It brought in \$69. Winning bidders were asked to pick up their purchases.

Light Pollution Committee Susan Sawyer-Beaulieu: Susan had good news from the good reception received from Essex County planning officials. Lighting legislation to help control light pollution is to become part of their official planning.

Business

Fund Raising for the Comber Dome project: Peter Bondy was unable to attend the meeting. Randy spoke on his behalf. The occupancy permit for the building has been received from Lakeshore Township. A name for the site and telescope is still needed. Suggestions are welcome but more are needed within the next 30 days. Randy noted the Trillium Fund application is very detailed but is nearly complete. Another group recently obtained \$23,000 for a similar purpose. Randy later mentioned one of our members just donated \$800 toward completing the dome project.

Aerial Dome Photograph: Randy passed around an aerial photograph of the site taken by the author who related the unusual circumstances resulting in the chance to take the shot with an unfamiliar digital camera. He further marveled at capability of these cameras. The air was turbulent and the aircraft passed over the site at high speed. In spite of these adverse factors the image was not blurred and had excellent resolution. It can be viewed on the club website.

Annual Picnic: Randy announced the picnic would be held at the Dome Site rain or shine on June 15th at 6:00 p.m. He reminded us all to bring lawn chairs and other picnic conveniences. The building will be formally open for the first time in its finished condition. Those equipped should also bring telescopes as it is planned to observe later in the evening.

(Continued on page 5)

May Meeting Minutes (continued)

Donations of furniture and shelves have been received. Two important donations are a brand new micro wave oven from Jeffrey Peacock, a Centre member from many years past. Randy donated a new coffee maker to go with the micro wave.

A portable outhouse will be rented for the occasion.

50/50 Draw: Frank Shepley announced the draw and the winner donated his winnings back to the club.

New Members and Guests: Three new members and one guest were introduced to the group.

Speakers for the Evening

Short Talk: Susan Sawyer-Beaulieu on the new Explore the Universe Certificate. Susan described a new program produced over a two year period by Chris Plenning from London Centre. It has been adopted by National and can be used to encourage an interest in astronomy to those unfamiliar with basic sights in the night sky. If 55 of the 110 astronomical sights can be found from a wide variety, a very attractive certificate can be earned. Only binoculars are needed. The list is available on the following site: <http://www.rasc.ca/observing/page2.html>. Acrobat Reader is required.

Main Speaker: "Strings and Things" by Harry Brydon. Harry has had a long term interest in Cosmology and Theology. A lot

of reading and preparation by Harry produced a well appreciated overview of the largest unsolved problem in science. The theories of relativity and quantum theory would seem to relate to one another but to date the relationships are not all understood.

He went into the history of mankind's search for these relationships and how Isaac Newton, Albert Einstein, Max Planck and others have brought us to our current understanding.

Then he broadened his talk to cover the mysteries of how all these relationships work either on the very large or extremely small scales (sub atomic). Then his talk went into the confounding strangeness we meet when the two are found not to relate (or make much sense at all) on some scales.

Our understandings of space, time, gravity and all that are familiar fail us. String theory is an attempt to resolve the mysterious and make sense of the relationships. It too has produced further mysteries which defy us for the time being. Chief among them is the apparent "communication" between some particles for no as yet understood reason.

Randy thanked Harry for his well prepared talk.

Meeting Adjourned.

UNIVERSAL SCIENCE

Windsor's Astronomy And More Store

We are operating on a pick-up and delivery system

Competitive pricing on MEADE, CELESTRON and SKYWATCHER scopes and accessories

Skywatcher 8" Dob with metal tube, 8x50 finder, 2" focuser, 25mm and 10mm Plossl eyepieces, new improved balance system. All this for an incredibly low price of **\$639 tax included**. Please allow 1-2 weeks for delivery. Check this scope out at www.skywatchertelescope.com.

One year old but used only a few times. Celestron G8 8" f/10 Schmidt Cassegrain on EQ-5 equatorial mount. 6x30 finder and Rigel Quickfinder. 25mm Kellner eyepiece. \$1,300 firm (usually sells for about \$1,700 + tax).

Less than one year old and used only a few times. Meade 10" Starfinder EQ. 10" f/4.5 reflector on equatorial mount, R. A. drive, 6x30 finder, 25mm eyepiece. Asking \$1,100 (regular price is usually \$1,200 + tax and shipping).

Contact Robin Smallwood

Monday - Friday 9:00 a.m. - 5:00 p.m., Saturday 9:00 a.m. - Noon, Closed Sunday

Telephone: (519) 967-1655 Fax: (519) 967-1657

Email: unisci@sympatico.ca



Is There a “Lock of Gravity” by Juliana Grigorescu

It might be here in our Solar System, and maybe everywhere else in our universe and all the unknown universes we don't know about. But let me explain to you what I mean by “lock of gravity”.

We now know that our Solar System formed some 4.5 billion years ago from a protostellar cloud of accretion material that become more and more compact in the middle to form our central star the Sun. The peripheral part of it was to become little “buddies” – planets, comets, asteroids.....

The way gravity acts around the Sun is something like bending the space-time toward it. Consequently all the bodies that happen to be in its sphere of influence will be forced to revolve around the Sun following different paths (elliptical, hyperbolic,....)

We have 9 planets (so far.....) in our Solar System, each with their own ID (mean distance, rotation period, revolution period, etc).

| Planet | Mean distance | Rotation Period | Revolution Period |
|---------|---------------|-----------------------------------|--------------------|
| Mercury | 0.38 au | 58.65 Earth days | 87.97 Earth days |
| Venus | 0.72 au | 243 Earth days rotates clockwise | 224.7 Earth days |
| Earth | 1.00 au | 1 day | 365 Earth days |
| Mars | 1.52 au | 1.026 Earth days | 686.98 Earth days |
| Jupiter | 5.20 au | 0.41 Earth days | 11.86 Earth years |
| Saturn | 9.54 au | 0.44 Earth days | 29.46 Earth years |
| Uranus | 19.19 au | 0.72 Earth days rotates clockwise | 83.75 Earth years |
| Neptune | 30.07 au | 0.67 Earth days | 163.72 Earth years |
| Pluto | 38.48 au | 6.39 Earth days rotates clockwise | 248 Earth years |

When the rotation period is equal or very close to the revolution period the planet is always facing the same side to the central star (similar for the satellites facing the same side to their “mother” planet, like our own Moon) – provided rotation and revolution are both in the same direction.

This is what I call a “gravitational lock” myself – when the body seems to be frozen in a certain position by gravity and it moves as if it's being anchored by a huge cosmic thread to the central star.

How many more satellites in our Solar System “behave” like our Moon? And why?

Also when the bodies move so that their rotation period is close to the revolution period (not significantly different) even if rotation is one direction and revolution another I still consider that kind of a trap of gravity (see Mercury and Venus, the 2 planets closer to the Sun than the Earth).

But the Earth has a different way of moving – it rotates much faster than it revolves.

Basically all the other planets in our System further to the Sun as the Earth rotate much faster than they revolve (one explanation is the further the planet, the bigger the orbit).

So, in our Solar System the closest planets to the Sun rotate very slow comparing to the other ones. Why? What prevents them from rotating much faster?

Is it the same for a planet system having many satellites, like Jupiter, Saturn, Uranus? What happens in the vicinity of a star or a planet? How does gravity really acts? **Is there a lock of gravity?**

Hey, too many questions at once, I know.

But I only hope that one day we will be able to understand the big mystery of gravity.