

# Event Horizon

June 2004

Volume 11 Issue 8

## Let the Sun Shine In

by *Cathy Tekatch*

Having safely observed the Venus Transit through our telescopes on June 8, how many of us realized just what a direct connection exists between our good health and the electromagnetic radiation from our very own sun-star, Sol. We often hear about how unhealthy it is to get too much sun, but we seldom hear about how unhealthy it is to get too little. Not only does sunlight make us feel better psychologically, it nourishes us physically and cleverly synchronizes our brain's biological clock to match the solar day and the solar year.

The daily biological clock is called the circadian rhythm and the yearly clock is called the circannual rhythm. Here's how it works: When the visible light spectrum of sunlight shines into our eyes there is a dramatic effect on the daily cycle of our brain's production of the hormone melatonin. Melatonin helps us sleep at night and contributes to the effectiveness of our immune system, plus much more. If our brain produces too much melatonin during the day from not getting enough sunlight, our bodies may think it's winter time and a hibernation type of response sets in and we can feel sleepy and depressed and crave carbohydrates. Bright light, either from sunlight or from a therapeutic fluorescent light box temporarily stops production of melatonin and is used to reduce depression, daytime sleepiness and carbohydrate cravings. Our circadian rhythm's control of the stress hormone cortisol causes production to increase in the early morning hours and is thought to have evolved in order to make our prehistoric ancestors ready for early morning predators. Appetite, metabolism, and natural sleep cycles are also partly controlled by these body rhythms as is the reproductive cycle in some animals because the brain will adjust the production of certain hormones depending on the changing light levels as the days get longer or shorter. In 1729 the French astronomer Jean-Jacques d'Ortous de Mairan studied circadian rhythms in plants.

Sunlight also physically nourishes us through its action on our skin. Ultraviolet B light from summer solar-noon sunlight causes our bodies to produce large quantities of Vitamin D. Once thought to only be useful for bone strength, some medical researchers believe that lack of Vitamin D from sunshine is responsible for an increase in many types of cancer including colon, breast, prostate and ovarian in addition to osteoporosis. Dr. Michael Holick, a vitamin D expert from Boston University believes that Vitamin D from sunshine controls cell reproduction, keeping cells from becoming cancerous. Holick also says that the skin will produce only as much Vitamin D as it needs - large quantities of Vitamin D taken from supplements and fish oil can be toxic. Because of ultraviolet's immune system effects, diseases such as multiple sclerosis and rheumatoid arthritis have also been associated with low exposure.

Correct filters on our telescopes are necessary in order to allow us to stare at the sun for long periods of time, obviously mother nature put our eyes on the fronts of our faces rather than on the tops of our heads for good reason. Nature also gave our bodies a tanning mechanism in order to keep out too much ultraviolet light, just as do our properly filtered telescopes. So, as long as you are careful you can safely view the sun with your telescope and also enjoy its health benefits.

To learn more about electromagnetic radiation check out [www.unihedron.com](http://www.unihedron.com)

by *Cathy Tekatch*

## Email Reminder notice

We send email reminders before each meeting which describes the location, time and topic of the general meeting.

If you're not on the list, make sure that you receive your reminder by sending a note to:  
[publicity@amateurastronomy.org](mailto:publicity@amateurastronomy.org)

Return to Saturn .....	page 2
Chair's report .....	page 3
Lunar Transient Phenomena Research .....	page 4

Did Kepler Poison Tycho? .....	page 5
Eye Candy .....	page 7
Upcoming events .....	page 7

## Return to Saturn by Ray Badgerow

After a journey of nearly 7 years, the Cassini spacecraft will reach it's ultimate destination, the planet Saturn on July 1, 2004. This rather long trek involved taking the scenic route twice past Venus, then Earth and Jupiter in order to pick up the necessary speed to reach. This was the so-called VVEJGA trajectory for those who wish to be more technical about it.

The approach to Saturn begins with a close flyby of the outermost moon Phoebe on June 11th, at a range of 2000 km. This pass will enable the entire surface of the satellite to be mapped, and it will be seen with a best resolution of 15m/pixel. In addition, the mass, and surface composition will be determined. After this the spacecraft will be quiet until it arrives at Saturn. Cassini will approach Saturn from the south and cross the ring plane between the F & G rings at a distance of 2.63 Rs. Fifteen minutes later as it passes over the A-ring, the main engine will fire for 97 minutes and slow the spacecraft down by 632 m/s. Following SOI, Cassini will be at its closest to Saturn some 1.3Rs, and will commence with scientific observations of the ring system for 90 minutes before descending through the ring plane. The observations will then be played back to Earth approximately 2 hr later. At no time during this phase will the High Gain Antenna be aimed at Earth. The initial orbit about Saturn (Rev 0) will have a period of 148 days with an inclination of 16.8 degrees. The next day on July 2 there will be a distant, but important view of Titan as Cassini will view the south polar region with a resolution of 2.1 km/pixel. This Titan flyby occurs at a range of 338,000 km, 9:30 UT. Here is a list of events that occur for the first few orbits around Saturn:

Name Satellite	Date /SCET	Alt(km)
OPH Phoebe	2004-Jun -11 19:33	1997
OMI(nt) Mimas	2004-Jul-01 00:30	76424
Ring Crossing -ASC	2004-Jul-01 00:47	2.6 Rs
SOI start	2004-Jul-01 01:12	dV=632 m/s 97 min
Periapse(CA)	2004-Jul-01 02:39	1.3Rs Phase=94
SOI end	2004-Jul-01	02:54
Ring crossing-DESC	2004-Jul-01 04:34	2.6 Rs
OTI(nt) Titan	2004-Jul-02 09:30	338,958 km
Solar Conjunction	2004-Jul-08 17:00	
Periapsis Raise	2004-Aug-23 17:00	dV=392 m/s
Titan-A	2004-Oct-26 05:30	1200 km
Titan-B	2004-Dec-13 11:37	2358 km
bDI(nt) Dione	2004-Dec-15 02:11	81,592 km
Probe Targeting	2004-Dec-16	
Probe Deployment	2004-Dec-24 09:00	
Orbiter Deflection	2004-Dec-29 03:00	dV=21 m/s
cIA(nt) Iapetus	2005-Jan-01 01:28	63,700 km
Titan-C	2005-Jan-14 11:04	60,000km Huygens Landing

by Ray Badgerow



Event Horizon is a publication of the Hamilton Amateur Astronomers (HAA).

The HAA is an amateur astronomy club dedicated to the promotion and enjoyment of astronomy for people of all ages and experience levels.

The cost of the subscription is included in the \$25 individual or \$30 family membership fee for the year. Event Horizon is published a minimum of 10 times a year.

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### **Chair's Report**

*by Glenn Muller*

Imagine heading up to Starfest, Canada's premier star party, but on the wrong weekend. When Gail and I chose to christen our new tent at the River Place Resort, on June 4<sup>th</sup> & 5<sup>th</sup>, that thought crossed our mind as we pulled onto the familiar, but now empty, field. On the plus side we were able to pick our spot at leisure, and camped by the ravine between two small hills where the burbling river muted the sound of the "seasonals" and minimized the effect of the trailerpark lights.

Though the congenial nighttime chatter and entertaining daytime activities were notably absent, a hint of Starfest could still be found among the staff who wore t-shirts from previous star parties and made a point of asking how our night's observing had been. The astronomy convention is a big deal to this place and the locals know it - they had us pegged as soon as we drove in - but as we drove out I realized that was yet another example of how our celestial pursuits can have a lasting effect on others.

Which segues conveniently into the next part of this report.

Last month I alluded to the HAA as being member-driven and I think that the following excerpts, from two e-mails, bear that out:

The first is from Mike Spicer:

"The local astronomy clubs do not seem to reach out well to a great source of new members - students in the local schools. I suggest that the HAA might sponsor a research and writing contest among local school students. One contest at grade 6-7-8 level and one for high school.

Each contest would have as its prize, a complete Meade DS-80 electronic control refractor telescope with finderscope, diagonal, eyepieces and moon filter. I volunteer to give HAA two of these telescopes for the prizes - if the club can put together a committee to send letters to Public and Separate Boards advising of the contest; [send] letters or flyers to each local school principal alerting to a contest; set up a committee to oversee the contest rules and requirements; [select] judges to pick a winner from [grades] 6-7-8 and a winner from high

school."

The second e-mail was from Hal Mueller:

"When I was young (Grade 6 or 7) a family friend, brought his home-made reflector and let me and some of my friends look at the moon. We saw deeply-shadowed craters and what impressed me at the time was the "11shimmering" that night. Little did I realize it was the "bane" of observing. That image of the moon is still fresh in my mind.

In my opinion, one way of reaching out to youngsters of all ages and thereby increasing membership in HAA is to present them with views of the moon in its various stages, particularly when waxing near 1<sup>st</sup> quarter. I propose that members setup telescopes for four consecutive evenings - July 21-24 - at Pier Park [Bayfront] as before, specifically designating this marathon for anyone interested in seeing the progression of phases of the moon."

You're right, guys - this is one area of astronomy that the HAA is more than capable of handling, and I encourage everyone to contact Mike Spicer at [DeBeneEsse2001@aol.com](mailto:DeBeneEsse2001@aol.com) and/or Hal Mueller at [hal\\_mueller@yahoo.com](mailto:hal_mueller@yahoo.com) and volunteer your resources.

Well, now that Summer is finally here we take a break from monthly meetings, until September. However, the lines of communication will remain open as will the website and, if I don't see you before, I'd like to see you at Starfest (Aug, 19-21) - one weekend in an empty field is enough for me! Clear skies!

Glenn invites your comments on these topics or any aspect of the club. He can be reached via [chair@amateurastronomy.org](mailto:chair@amateurastronomy.org)

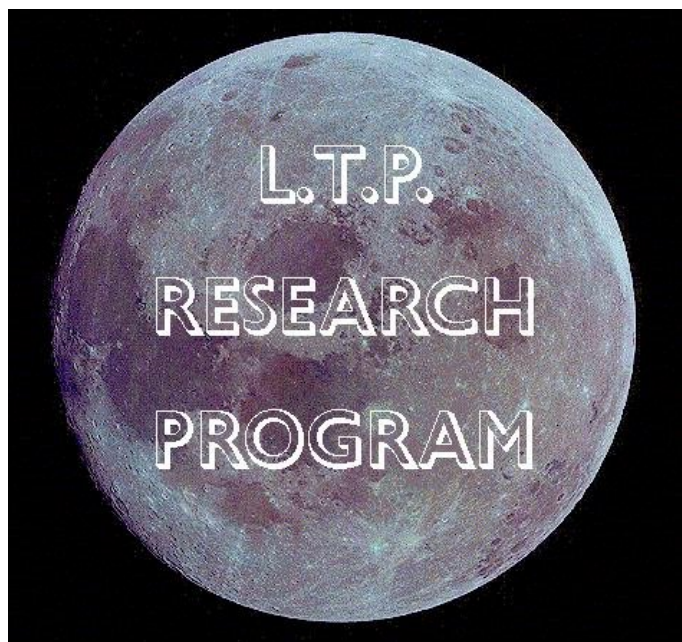


### **Council meetings**

All club members are welcome to attend the council meetings. Contact [info@amateurastronomy.org](mailto:info@amateurastronomy.org) for details.

## LUNAR TRANSIENT PHENOMENA RESEARCH

*submitted by Jim Winger*



### LUNAR TRANSIENT PHENOMENA RESEARCH PROGRAM

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30 May 2004

Dear Jim Winger:

I am sending this letter to inform you for the need for lunar observers. They are needed to participate in a global effort to monitor the Moon for Lunar Transient Phenomena. Lunar Transient Phenomena is short lived changes detected on the Moon and can consist of glows, flashes, darkening of lunar features and red and blue color phenomena. My goal is to coordinate and combine the talents and efforts of the professional and amateur astronomical community from around the world to monitor the Moon during upcoming spacecraft missions to the Moon. This concerted effort will be to assist all observers who choose to participate with the latest information about lunar transient phenomena and the latest information on reported events. There will also be coordinated observing programs to examine the behavior of historical lunar transient phenomena sites under similar lighting conditions.

This L. T. P. Research web site will also be an effective tool for observers with similar interests to communicate with each other concerning their own study of

this phenomena and to present ideas on other lunar topics by utilizing the Internet and email as a cost effective conduit.

The primary function though is to attempt to establish a world wide network of observers that can be contacted when a lunar transient phenomena event takes place. Due to cost involved the use of Internet can be extremely effective and allow almost immediate notification to observers all over the world. Also being part of this network will help people learn of other observers within their region who also share an interest in this phenomena.

I have had the pleasure of establishing and running two major ground based operations in coordination with the Clementine mission and the Lunar Prospector mission. With both of these programs I had about 150 observers in many different countries participate with great success. What I did not have was a WEB Site to allow more interaction with the observers and have the ability to post the latest information about recently observed phenomena. The information about these two mission is located on my web page under Past Ground Based Observing Programs.

It is generally expected that observers participating with this program would have a background in lunar observing. This is very helpful but should not discourage the newcomer to lunar observing. I have established a manual for frequently asked questions about how to observe and document lunar transient phenomena. Also there are many books on lunar observing that have been published that will assists the observer in a better understanding of this subject.

You are probably wondering what is this going to cost you. In the form of money nothing. I require no dues or fees for your participation. I only require that you observe, document, and submit observations. The time commitment to the program is up to you. There are generally four levels of participation. The first level is to just monitor the Moon whenever out observing and if you detect something unusual you submit a report and if possible activate the lunar transient phenomena network to attempt to get a confirmation. The second level is to systematically observe selected features on the Moon monitoring them for any changes or abnormal appearance. The third level is to participate in coordinated observing sessions of a specific lunar feature, recording and documenting what is observed during that observing window and submitting your reports to be evaluated and analyzed. The fourth level would be to monitor the Moon during a space mission

to the Moon. Presently there are no missions at the Moon. The Lunar Prospector was the last and the observations from that have been posted on my web page under Past Ground Based Observing Programs. Future missions on the drawing table are the Smart 1 by the European Space Agency, planned arrival to the Moon in December 2004, and the Lunar A to be launched in 2004 or 2005 by the Japanese Space Agency. Both of these missions I have contacted the Principle Investigator and they have endorsed our participation by monitoring the Moon during their time in orbit around the Moon. The third mission called Lunarsat will happen in 2005 and is by the European Space Agency. The fourth mission on the table is again by the Japanese and is called Selene and expected to launch in 2004 or 2005. There is also a private company called Trans Orbital which is planning a Moon shot to conduct live video and high resolution imaging of the lunar surface, December 2004. This mission will only last for three months. Those who decide to participate with the program at what ever level you chose will be kept informed by monthly newsletters and updates being placed onto the LTPRESEARCH web site.

If you want to become a part of this international program click on the my web site and complete the registration form and join the great adventure.

Thank you for taking the time for reading this request and I hope to hear from you soon.

My Web Site is: [www.ltpresearch.org](http://www.ltpresearch.org) you then go to Observer Registration and complete the form.

Thank You.

David O. Darling

Association of Lunar & Planetary Observers & British Astronomical Association, Assistant Lunar Transient Phenomena Recorder

### **Did Kepler Poison Tycho?** by Rita Griffin-Short

The "Globe and Mail", Saturday, May 29th, carried an article by Dan Falk about a new book by Joshua and Anne-Lee Gilder, "Heavenly Intrigue: Johannes Kepler, Tycho Brahe, and the Murder Behind One of History's Greatest Scientific Discoveries", Doubleday:2004. A long-winded title for a book in which the authors argue that Kepler wanted Tycho's log books so badly he resorted to murder.

The book arrived as I was reading, simultaneously in my usual way, about these two giants of astronomy: Kitty Ferguson's 'Tycho & Kepler'; James A. Connor's

"Kepler's Witch", about Kepler's mother who was tried and jailed as a witch; Owen Gingerich's "The Eye of Heaven", while revisiting Christianson's "On Tycho's Island", Arthur Koestler's "The Sleepwalkers". I put them aside to scan this new research which uses new analyses of Tycho's hair.

Let's review the relationship between Tycho Brahe (1546-1601) and Johannes Kepler (1571-1630). Both were born in December, Tycho on the 14th and Kepler on the 27th, a generational difference of twenty-five years. They were men of very different temperaments, world's apart socially: Tycho, a Danish nobleman, Johannes, a child of a once noble family that boasted a Coat of Arms but now living in "straitened financial circumstances" that had brought the Kepler family "to the level of craftsmen". For Tycho, money was no object, he was used to giving orders, expecting them to be carried out in this highly stratified society. To him, Kepler was just another servant, though he conceded Kepler was a brilliant mathematician and thinker, someone he needed to help him get his world view into print.

Johannes, on the other hand, had been a sickly child in an unstable family, perhaps not shown the love a child needs. He was nearsighted, not a good thing for a mathematician nor for naked eye astronomy. He resented his family's loss of status, lacked the self discipline and self confidence that being a brilliant student should have given him. His hypercritical nature would have made friendships difficult.

These were difficult times, the Turks were threatening the eastern borders of the Holy Roman Empire while the ongoing religious wars of the 15th c. continued to divide Northern Europe. Reformation and Counter-Reformation competed with each other, dissenting amongst themselves. The Counter-Reformation was given impetus by the founding of the Society of Jesus, the Jesuits, which set about reforming the Roman church. What had been relatively stable enclaves within the empire became cruelly intolerant on both sides, exploding into the Thirty Years' Wars in 1618 in Prague, the empire's capital. Caught in the middle of this seething pot of bigotry, intolerance and superstition, the contretemps between Tycho and Kepler was played out.

Kepler had been studying theology at Tübingen, about to be ordained, when he was told to pack and take up a position teaching mathematics in Graz. The reasons for this precipitous move are not clear. It is suggested that his pro Copernican views were unwelcome but Lutheran Tübingen was a hotbed of Coperni-

canism. It seems Kepler was having doubts about his religious beliefs and his teachers would have steered him away from the clergy. It was Tübingen that printed his "Mysterium Cosmographicum" in 1596.

Graz was one of those towns where Protestants and Catholics were competing for power. The Jesuits were pouring money into schools and a university while the Protestants were lagging behind. Kepler didn't have many students for his difficult subject and he was poorly paid. To supplement his salary he accepted the offer to produce the calendar and cast horoscopes. Kepler married in Graz and lost two children there before the catholic Archduke Ferdinand gained power. The Keplers were roughly treated though not as badly as some; when their little daughter died, she was refused burial until Kepler paid a fine. Lutherans were expected to convert or leave. Kepler was reprieved for a time because he was needed for the calendars and horoscopes, but eventually he was forced out. The family became refugees in Prague where Tycho took them in.

Tycho had grown increasingly unhappy on his Danish Island of Hven, his tenants resented him, and the new king, Christian IV, on the advice of his ministers, began stripping the incomes from his many properties. Tycho had taken a commoner as his wife, their issue were not considered legitimate and could not inherit. His was a happy family and he wanted to be able to legitimize the relationship (this he did in Prague). He decided to seek refuge in the east, leaving in 1597 with his family, dozens of baggage carts and carriages. Along the way he sent out feelers for a 'Maecenas' and found one in Prague in the person of Emperor Rudolph II. Rudolph gave him a private audience, appointed him his chief mathematician, presented him with Benátky Castle and a salary that didn't always appear when it should.

Tycho was not a well man at this point, he was fifty-one and irritable. He missed Hven, and arranging the move east was a logistical challenge on top of his regular responsibilities. This took him away from astronomy and on the move he didn't have access to his best instruments which had been left behind for later shipment to a new Uraniborg. He set about renovating Benátky to suit his purposes, but he wasn't his own man, he was at the emperor's beck and call which he resented. Casting horoscopes and dispensing elixirs were a nuisance.

Kepler had written to Tycho, sending him a copy of his book to which Tycho had eventually replied inviting him to visit. Now that he had to leave Graz he decided to do that. He was able to arrange a ride with one of

Rudolph's ministers and leaving his wife in Graz, he went to Benátky. Their initial meeting was cordial, but Tycho was preoccupied with settling in his new home and the emperor's demands. Kepler felt slighted at being left in the care of Longomontanus. He didn't even get a peek at the log books he so desperately wanted to see. Obviously unhappy, Kepler being Kepler, he threw a tantrum, wrote a nasty letter to Tycho and went back to Prague. There he was urged to patch things up and Tycho made a great effort, but he wanted an apology which Kepler grudgingly gave him. Kepler was in a humiliating position with no money or home. They did work something out, Tycho would give him a salary and accommodation until he could find a way to get him on the emperor's payroll. Tycho didn't fully trust Kepler to work on his system of the world and not that of Copernicus' to which Kepler was committed.

A month after Kepler had returned to Benátky to work, Tycho dined out with friends, overeating and drinking as was his way. Court etiquette forbade a guest to leave the table as long as the host remained seated. Tycho needing to relieve himself held it and continued drinking. He was unwell when he arrived home, unable to urinate and took to his bed where fever developed then delirium. This cleared a few days later and he was lucid enough to speak with his family and servants, bequeathing them his precious log books. A day later he was delirious and died. We don't know what sort of medical attention he was receiving. His physician, Jan Jesensky, was away at the time, returning in time to give the eulogy at Tycho's funeral. A firm friend to Kepler, Jesensky would later meet a brutal death, a victim of Counter-Reformation revenge.

Was Tycho's a natural death? Was he poisoned and if so by whom? This is the question the Gilder's ask. They have new evidence for mercury poisoning and suggest that only Kepler had the ability and motive to do the deed, though opportunity remains vague. The authors offer a formidable amount of technical data that I've not the expertise to understand as legitimate. These rest on analyses of the hair from Tycho's beard recovered many years ago that indicate he ingested two fatal doses of mercury. The first around the time of the dinner, the second the day before he died. After the first dose, the test shows a mercury peak that levels off, which they say accounts for Tycho's brief period of lucidity and that if a second dose hadn't been ingested he might have recovered. This is hardly secure evidence! For a murder to be committed motive and opportunity are necessary. Kepler had neither.



The day before the fatal dinner, Tycho met with Kepler, turned over all his log books and introduced him to Rudolph. Tycho asked Rudolph's permission to dedicate a new set of astronomical tables to him, to be called Rudolphine Tables and that Kepler his new assistant would work on them. The emperor was delighted and Tycho was able to get Kepler a proper salary. This was music to Kepler's ears, he would no longer be supported out of Tycho's pocket and he would be working on the observations. He now had what he wanted.

The evidence of mercury poisoning seems reasonable but not that Kepler did it. Kepler was not living at Benatky, only working there, he would not have mingled with the family except at meal time. While he had knowledge of alchemical techniques, he didn't dabble in these things. When would he have had the opportunity to give the poison to Tycho? He wasn't at the dinner at which Tycho is thought to have ingested the first dose. Tycho had made enemies at court, but no evidence is provided as to who they might be. How would Kepler have given Tycho the second fatal dose? I doubt he was admitted to the sickroom alone, if indeed he ever was in the sickroom. We don't know if Tycho had given orders for medications before he became delirious. There are more questions than answers in the book.

While Dan Falk dismisses the book's premise, it nevertheless opens a new window on Tycho's unfortunate death, a death from which Kepler surely profited. He was immediately appointed the emperor's mathematician and given authority over Tycho's instruments and scientific materials. He quickly took the log books into his care without seeking the family's permission, a discourtesy that would cause problems for him later.

All these men tinkered with minerals and chemicals, ingesting them either accidentally or purposely. We continue to do so today and knowingly. One wonders how many of their deaths were the result of such poisonings. Physicians haven't always followed Hippocrates's admonition to 'do no harm'.

*by Rita Griffin-Short*

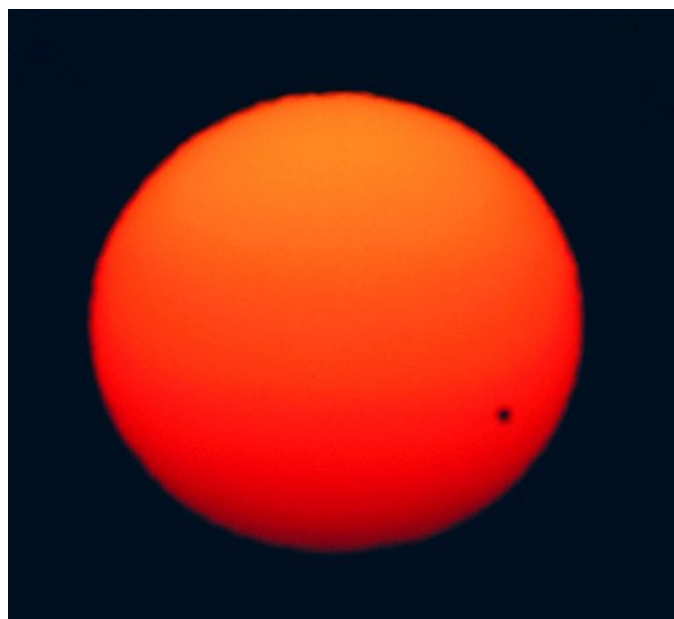
**Event:** HAA meeting

**Date:** Friday September 10, 2004 7:30PM

**Location:** Watch web site for location. [www.amateurastronomy.org](http://www.amateurastronomy.org)

**Admission:** Free. Everyone is welcome!

### Photos by Malcolm Park



### Upcoming Events

**Event:** STARFEST

**Date:** AUGUST 19th-21st

**Location:** Mount Forest

**More info:** [www.nyaa-starfest.com](http://www.nyaa-starfest.com)



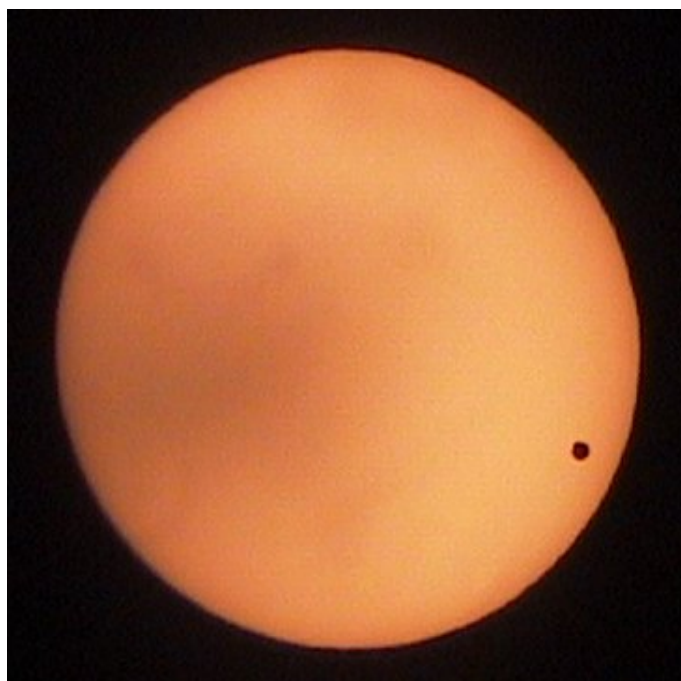
Doug Black's daughter Sarah enjoying the Venus Transit party. Pictures taken by Malcolm Park of the NYAA

### Photos by Glenn Muller

See more of Glenn Muller's photos from the June 8, 2004 Venus transit party at [home.interlynx.net/~mullers/Transit](http://home.interlynx.net/~mullers/Transit)



"Mac-stronomers"



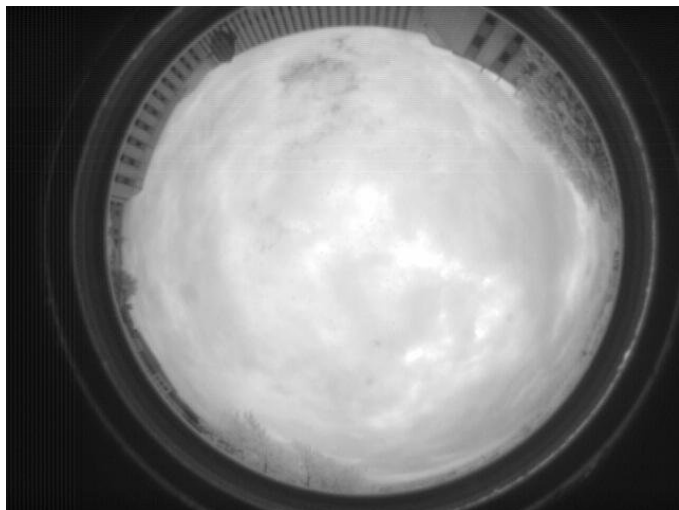
There were so many telescopes set up at Van Wagner's Beach in Hamilton on Tuesday June 8th, I just walked up and snapped this one through the telescope of a friendly fellow astronomer.



A hint of the "black drop" effect



## All Sky camera



This is one of the first images from the McMaster All-sky Camera. Its purpose is to help locate meteorite falls when there is an extremely bright meteor seen in the area. At present, the "network" of all-sky cameras in southern Ontario has only two other such cameras, both operated by UWO and sited near London, Ontario. The roughly 100 km distance between the sites is very nearly optimum for meteorite-fall and orbit work.

A low-light Sony video camera with a 1/2-inch CCD and fish-eye lens feeds a special digital-signal-processing box designed and produced at Sandia Labs in the US. It differences frames in real-time and when something passes its test for "meteorness", it starts saving a 6-second patch of video which is saved in RAM and then (slightly later) transferred to the disk of a 500 MHz (!) computer using its parallel port (!!).

Apparently it is also good at detecting lightning and flares from Iridium satellites!  
Photo and story by Doug Welch

## Comet NEAT

by Bob Christmas



Comet NEAT Composite



Comet NEAT And The Beehive



## Far-out Ideas

by Patrick L. Barry

Ever had a great idea for a new spacecraft propulsion system, or for a new kind of Mars rover? Have you ever wondered how such “dinner napkin sketches” evolve into real hardware flying real missions out in the cold blackness of space?

The road to reality for each idea is a unique story, but NASA has defined some common steps and stages that all fledgling space technologies must go through as they’re nursed from infancy to ignition and liftoff.

Suppose, for example, that you’ve thought of a new way to shield astronauts from harmful radiation during long space missions. In the first stage, you would simply “flesh out” the idea: Write it down, check the physics, and do some quick experiments to test your assumptions.

If the idea still looks good, the next step is to build a “proof of concept.” This is the “science fair project” stage, where you put together a nifty demonstration on a low budget—just to show that the idea can work.

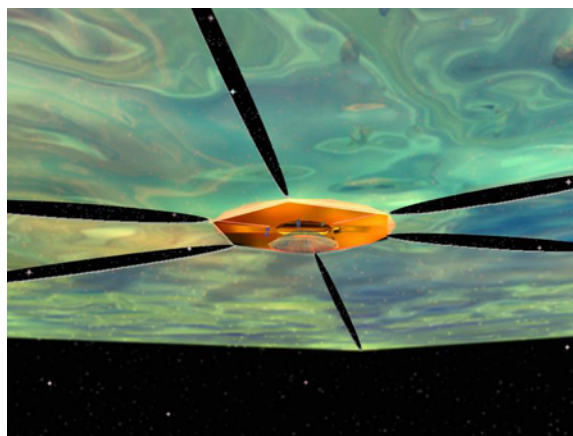
For your radiation-shielding idea, for example, you might show how a Geiger counter inside a miniature mock-up doesn’t start clicking when some radioactive cobalt-60 is held nearby. The shielding really works!

Once that hurdle is cleared, development shifts into a higher gear. In this stage, explains Dr. Christopher Stevens of JPL, the challenge isn’t just making it work, but making it work in space.

“Some conditions of space flight cannot be adequately simulated here on Earth,” Stevens says. Cobalt-60 doesn’t truly mimic the diverse mixture of radiation in space, for example, and the true microgravity of orbit is needed to test some technologies, such as the delicate unfolding of a vast, gossamer solar sail. Other technologies, such as artificial intelligence control systems, must be flight tested just because they’re so radically new that mission commanders won’t trust them based solely on lab tests.

Stevens is the manager of NASA’s New Millennium Program (NMP), which does this sort of testing: Sending things to space and seeing if they work. In recent years the NMP has tested ion engines and autonomous navigation on the Deep Space 1 spacecraft, a new “hyperspectral” imager on the Earth Observing 1 satellite, and dozens of other “high risk” technologies.

Thanks to the NMP, lots of dinner napkin sketches have become real, and they’re heading for space. You can learn more at the NMP website, [nmp.nasa.gov/](http://nmp.nasa.gov/).



*This is just one idea of how a solar sail could be used to power an interstellar probe. A solar sail is one possible type of new technology that NASA’s New Millennium Program would test in space before it would be risked on a scientific mission.*

This article was provided by the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.

## Venus transit photo by Steve Barnes





[www.main-sequence.com](http://www.main-sequence.com)



[www.mec.ca](http://www.mec.ca)



[www.meade.com](http://www.meade.com)



[kendrick-ai.com](http://kendrick-ai.com)



[www.starlight-theatre.ca](http://www.starlight-theatre.ca)



[www.perceptor.ca](http://www.perceptor.ca)



**FIREFLY BOOKS**

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[www.camtechphoto.com](http://www.camtechphoto.com)

**O'Neil Photo & Optical Inc.**

[www.oneilphoto.on.ca](http://www.oneilphoto.on.ca)



[www.skyoptics.net](http://www.skyoptics.net)



[www.skypieces.com](http://www.skypieces.com)



[www.khanscope.com](http://www.khanscope.com)



# July 2004

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday																																																																	
				1 Canada Day Cassini arrives at Saturn	2	3																																																																	
4 Venus near Aldebaran 5AM	5	6	7	8	9	10 Mars near Mercury 10pm																																																																	
11	12	13	14 Venus is bright tonight	15	16 Observing Night	17 Observing Night																																																																	
18	19	20	21	22	23	24																																																																	
25	26	27	28	29	30	31 Blue Moon																																																																	
			For observing info, call Stewart Attlesey 827-9105, Rob Roy 692-3245, Glenn and Gail Muller 945-5050, <a href="http://amateurastronomy.org/events.php">http://amateurastronomy.org/events.php</a>		<div>June 2004</div> <table><tr><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td></tr><tr><td>13</td><td>14</td><td>15</td><td>16</td><td>17</td><td>18</td></tr><tr><td>20</td><td>21</td><td>22</td><td>23</td><td>24</td><td>25</td></tr><tr><td>27</td><td>28</td><td>29</td><td>30</td><td></td><td></td></tr></table> <div>August 2004</div> <table><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr><tr><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td></tr><tr><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>20</td><td>21</td></tr><tr><td>22</td><td>23</td><td>24</td><td>25</td><td>26</td><td>27</td><td>28</td></tr><tr><td>29</td><td>30</td><td>31</td><td></td><td></td><td></td><td></td></tr></table>								6	7	8	9	10	11	13	14	15	16	17	18	20	21	22	23	24	25	27	28	29	30			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31				
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