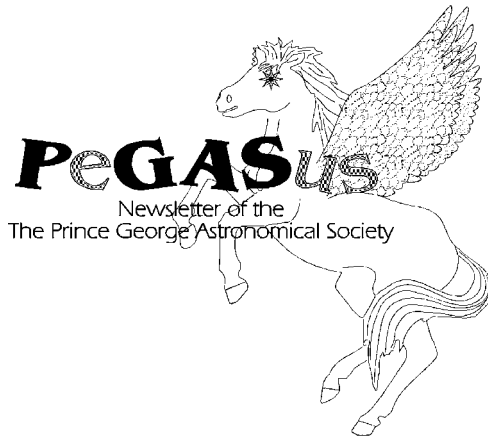


PeGASus
 Newsletter of the
 Royal Astronomical Society of Canada
 Prince George Centre

October 2006

Our pursuits are out of this world.
 Our activities are astronomical.
 Our aim is the sky.



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In Issue # 154

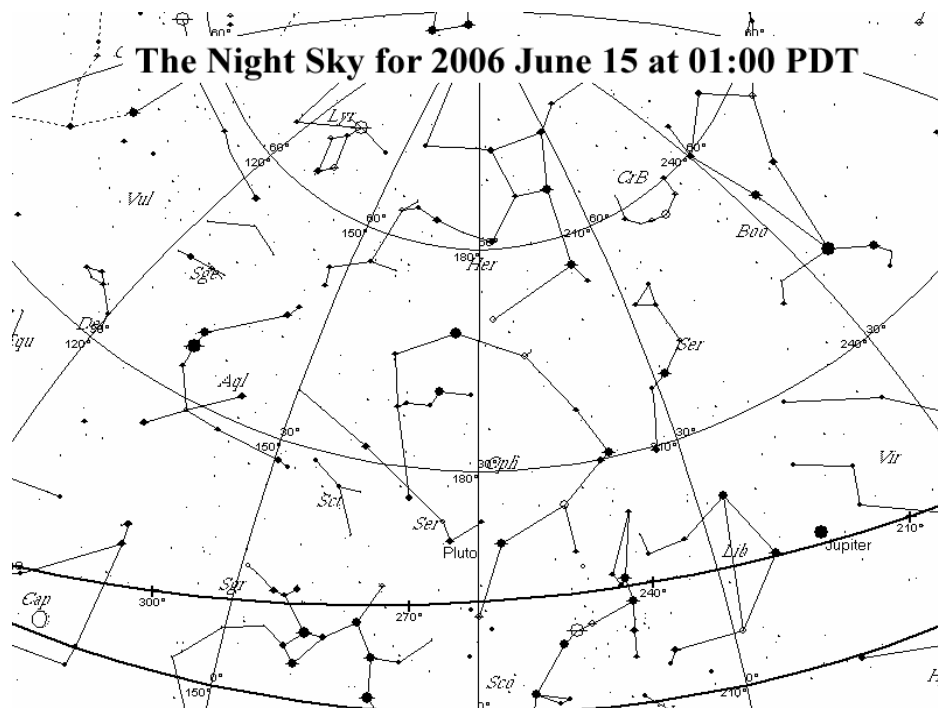
PGAS Executive	2
Coming Events	2
Editorial	3
The Night Sky	4

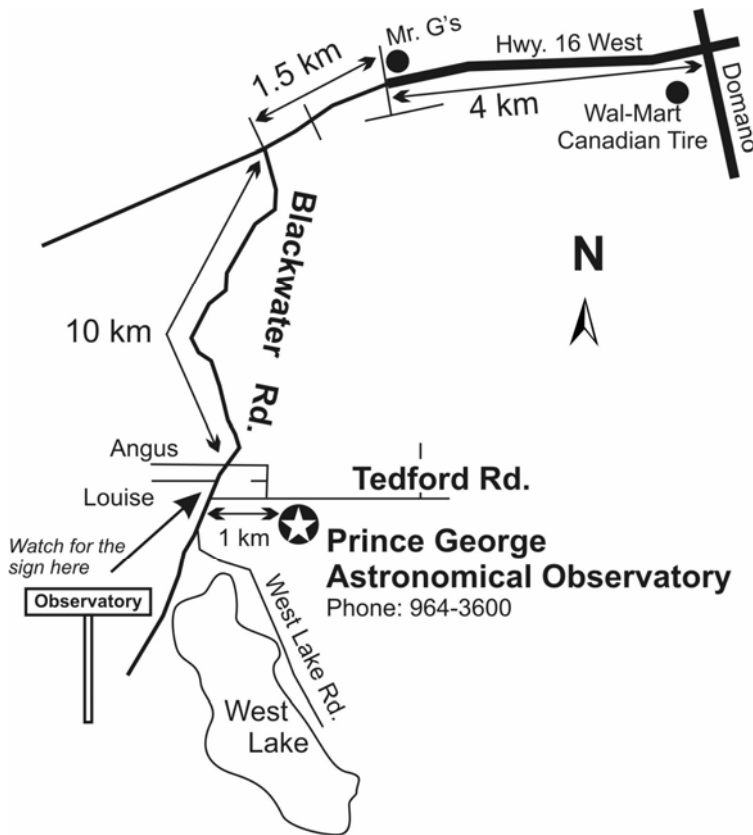
What's Out There

The Coming Rift of North America	6
Howl at The Moon	7
Observatory News	8
Transits of the Sun	9
Our Privacy Statement	11

**The RASC-PG meets next,
 7:30pm Wednesday October 25, at The Observatory**

Please note: This meeting is also our AGM and elections, Please attend and participate in Your RASC





Contributions to the newsletter are welcome.

Deadline for the next issue is

November 10

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Coming Events

Executive meeting 7:30pm November 8 (location TBA)

General Meeting And AGM 7:30 pm October 25

At The Observatory

Next NOVA class November 4th

Mercury Transit, November 8th , all day

PG Centre Exec Meeting November 8th 7:30pm

NOVA #3 November 19 th

Pro D day at the Observatory November 24th, all day

Regularly scheduled Open House and Members nights

Every Friday and Saturday evening in November

Editorial

Gil Self

A few weeks back I received a phone call from a member of a RASC centre in southern BC. He was planning a trip to Prince George and wondered if we had any events planned in the next couple of weeks. As it turned out the time frame he was interested in was rather busy. This was shortly before we presented ArmChair Astronomy at UNBC. As I answered his questions and related the various events planned during that two week period, I'm sure I heard his jaw drop. A lot of RASC centres have only one or two events a season. We often have two events a week.

I was fortunate to participate in this year's first NOVA lesson on Saturday night. It was a great evening, we have about twenty new people in our group. Between ArmChair Astronomy and NOVA, this club is finding people interested enough to invest some money and commit their time to be introduced to this absorbing and interesting pastime, and probably a lifetime pursuit. I am sure we all look forward to meeting these new members and in the long run we all learn from each other.

I have been remiss in the past for failing to mention a very supportive member. This past weekend, Friday nights' open house was the best attended open house this season, and I think there is a very good reason for this. There is a quite gentleman by the name of Paul Strickland. Paul attends almost every "event" we put on, which in itself is great. Having members that turn out to help out is always a good thing, but Paul also writes about us in the Citizen. I think it is often Paul's articles that bring the very large crowds out to the observatory for public events. Thank you Paul, you are always very welcome at any of our events.

I wanted to include an article (letter) I received from Fae Mooney. Normally "What's Out There" would be a separate item in the newsletter, but I thought I would share my space with Fae this month.

GS

WHAT'S OUT THERE

by Fae Collins Mooney

On the evening of Wednesday, October 11th, I sat in on the executive meeting of the RASC PG Centre as a guest, and as an assistant to the editor of PeGASus. The meeting went like most meetings do, but what struck me about the members at this meeting was the dedication and the generosity of our executive - their dedication to the membership, their donation of their time, expertise, talents, and knowledge to our centre.

A lot of what was on the agenda was about making things better for us when we visit The Observatory, like adding safety features like handrails, or installing a gauge to make sure we don't run out of water, or snow removal in winter. Little things, but important. Also on the agenda were discussions involving upgrades or improvements to existing equipment, and the purchase of new equipment - to make observing the sky even better!

And, of course, there are tours to be given - who will be the tour guide? And meetings to be planned - the Annual General meeting on the 25th. And the weekly Open House on Friday nights - who will be the host? Saturday nights belong to the members - who will be there? And special projects - have you ever watched Mercury cross the face of the Sun? It's going to happen in November, and a member is organizing the details for observing the event.

I have to say that I am impressed. I can't help feeling excited about the potential for this astronomical society; and I'm excited about being a part of it, even if only in a small way. It fosters and encourages the passion that we share as amateur astronomers no matter what our interests or involvement might be. We have every reason to be proud of the society's accomplishments, and The Observatory, and the degree to which this RASC centre reaches out to the community of Prince George.

Congratulations to this executive, and a big thank you!

Fae

The Night Sky for November 2006

by Bob Nelson, PhD

Hi Folks,

As I write this, it is a cloudy Saturday afternoon here in Prince George. The leaves from our birch tree have largely fallen, my wife and I (helped by our 3-year old grandson) have done some raking already, but many leaves still cling stubbornly to their branches. We hope that they will fall before the snow comes. (There is no hope for the mountain ash tree – its leaves usually fall on the snow in November!)

I cannot complain about the weather, though – I have had a phenomenal string of clear or partially clear nights of late. Out of the last 19 nights, I have observed 16! As most of you know, I have a robotic telescope in my backyard. On it, I have a SBIG ST-7XE CCD camera (with 4 coloured filters) that I use to study eclipsing binary stars. Of late, I have been building up *light curves* of three eclipsers. [A light curve is a graph of brightness – expressed in magnitudes – over a whole period of the motion. The values are folded around the period, and the parameter for the horizontal axis is the *phase* = the fraction of the cycle from 0 to 1.]

The data from the light curve will be combined with the spectral data that I have already taken at the DAO (Dominion Astrophysical Observatory) in Victoria to yield complete solutions for all the parameters in these interesting systems. I hope to give a talk soon at a monthly meeting where I will be able to share with you some of my recent results.

Anyway, here is what is going on in the sky this month:

MERCURY is mostly a morning object this month. At mid-month, it rises about 1½ hours before sunrise, when it will be 11° up from the horizon in the southeast. It will be a 9” disk of magnitude 0.8 then (pretty tiny). On Nov 8 (see below) it will transit the Sun.

VENUS has now become an evening object! However, don’t get too excited as, for most of the month, it sets only about ½ hour after sunset. Better viewing lies ahead.

MARS, in Virgo until November 3, when it passes into Libra rises at mid-month about ½ hour before the Sun. It’s a 3” disk of magnitude 1.6 (tiny!!). **On November 14, it passes to within about 9’ of Alpha (1,2) Librae,

JUPITER, in Libra until December, is not visible this month. It reaches conjunction (with the Sun) on Nov 21. It also makes a conjunction with Venus on Nov 15, at 13:20 PST, but since both are only 4° from the Sun, there is little hope of seeing it.

SATURN, in Leo until 2009 (Sept), is an evening object (just barely), as it rises at mid-month at about 23:50 (PDT). It’s an 18” disk of magnitude 0.5.

URANUS, in Aquarius until 2009 (March), is an evening object, setting at mid-month at about 01:44 (PDT). As usual, it’s a 3.6” disk at about magnitude 5.7.

NEPTUNE, in Capricornus until 2010 (March), is a fine evening object, setting at mid-month about 6 hours after sunset. As usual, it’s a 2.3” disk at about magnitude 8.0.

The big event -- that everyone is talking about -- is the transit of Mercury this month on Nov 8. Here are the critical times, in PST:

First contact: 12:12:04 PST (just past noon), second contact: 12:13:57, third contact: 16:08:16 and last contact: 16:10:08. For full details, see the Observer's Handbook for 2006 on page 135. Try to recreate it on any of the planetarium programs that you might have. Better yet, observe it on the great day, take some photographs or perhaps a time-lapse movie!

WARNING: Never look directly at the Sun, even for an instant, with the naked eye, as permanent damage will soon occur. A number 14 welder's glass is safe; however Mercury, at ~10", is too small to make out without magnification. Therefore, you will need a telescope with a proper solar filter. There will be a number people out at the observatory on that day with that equipment; check with any member of the executive for details.

CONSTELLATIONS to look for in November (at 21:00 PST) are Sculptor, Western Cetus, Pisces and Andromeda.

Sculptor (Scl, "The Sculptor's Tools"), another southern constellation at the limit of our visibility here in Prince George lies out of the Milky Way. It contains NGC 253, a spectacular spiral galaxy, a number of fainter galaxies, a faint globular (NGC 288) and, near the latter, the south galactic pole which, at declination 27.5 degrees south, is just visible from Prince George. The brightest star, Alpha Sculptoris, is a B7 giant radiating 1700 times solar, has a radius of 7 times solar, and a mass of 5.5 solar. The reason it is so dim (at 4.3 mags) is that it lies at a distance of 670 light years. Its claim to fame -- and the reason I am telling you all this -- is that at an age of 81 million years, it is at the end of its hydrogen-fusing cycle. The core, which is comprised almost entirely of helium, will ignite after the star expands, the surface cools, and the star becomes a red giant. The star is presently classified as a slow rotator; this relative stillness results in a lower than solar surface helium abundance (no mixing) and an enhanced abundance of heavier elements such as silicon, titanium and manganese. The magnetic field generates star spots, enabling astronomers to measure its rotation period. The magnetic field occasionally flips and controls the behaviour of a close-in cloud of circumstellar gas. [Taken in part from <http://www.astro.uiuc.edu/~kaler/sow/fomalhaut.html>.]

Western Cetus (Cet, "The Sea Monster"), contains a number of galaxies, including M77, which is a bright and compact spiral galaxy, contains three distinct sets of spiral arms and lies about 60 million light years distant. According to Burnham, this and NGC 4594 in Virgo (The "Sombrero") were the first two systems in which very large redshifts were discovered, leading to the discovery of the expanding universe.

Pisces (Psc, "The Fishes"), lies on the Zodiac. It contains M74, according to Burnham, one of the faintest and most elusive of the Messier objects requiring a dark sky and suitable eyepiece. Pisces also contains, according to Norton's 2000.0 Star Atlas, the galaxies NGC 487 and 524.

Andromeda (And, "The Princess of Ethiopia"), is familiar to most of us; it contains the "Great Andromeda Galaxy" M31 along with its satellite ellipticals, M32 and NGC 205 (a.k.a. M110 -- but not really on Messier's list). According to Burnham (and the references therein), M31 has been known at least as far back as 905 AD; it was known as "The Little Cloud" and appeared on star charts long before the invention of the telescope in 1609. Simon Marius is usually credited with the first telescopic observation in 1611 or 1612. Early observers thought the "nebula" consisted of glowing gases but long photographic exposures early in the 1900s revealed it to be a vast star system. Edwin Hubble, observing Cepheid variables with the 100" Mt Wilson telescope, established the distance as around 90,000 light years, well out of this galaxy. Later, corrected calculations in 1953 extended the distance out to 2.2 million light years. We now know that M31, along with M33 and our galaxy, are the three largest members of the "Local Group", gravitationally bound and holding numerous smaller galaxies, including the Large and Small Magellanic Clouds. Needless to say, M31 has been the subject of many studies by professionals using the largest telescopes and is also a fine object for amateur study and photography.

Clear skies to all,

The Coming Rift of North America by Art Beaumont

The Mississippi River flows southerly and is believed to follow a buried rift system. In 1811 and 1812 the river was disrupted by several major earthquakes at the town of New Madrid (89.5 W, 36.6 N). Land slides along the banks and channel diversions required relocating the town several times. It was unusual in that the area was not known for seismic activity.

My work, which may be known to some, points out that there was an unusual grouping of solar eclipses during 1811 and 1812 which were visible partially at or close to the town. The moon and sun being in near exact alignment would set up larger than normal on the earth near the town and suggests a connection between earthquakes and gravity (also plate tectonics and continental drift.)

So when is the rift of North America coming? Eclipses on the Pacific Coast seem to have a period of about 586 yrs (the Tetradaia eclipse period). and that perhaps the year 2400 would have similar eclipses near then. Eclipses of Mar 29, 2378, Sept 11, 2379 and Aug 1, 2380 approximate the conditions of 1811 and 1812. Those years also have smaller eclipse intervals indicating higher tidal forces. Therefore 2380 duplicates conditions of 1812. (The 18 hr GMT of the eclipses puts the sun and moon on the meridian of New Madrid).

So will 2380 see the continent spit in two leading up to the St Lawrence? Or will it be to Hudson's Bay? Will Canada lose precious fresh water to the south? Will maps be redrawn to Western and Eastern North America?

This all speculation which I am not suggesting in my book but has eye-catching appeal to publicize by book "Energy Changes from Tides". This approach is in keeping the sensationalism of other as a sales gimmick but if it work so be it. In any case proceeds from the book go to the observatory.

A.B

Just a really good idea!

Thanks, to Blair
Nice lawn!



Howl at the Moon

Friday night at the observatory, not a cloud in the sky and it's a full or near full moon, why is it does the sky seem brighter out here than in town. Scope's powered and aligned, let's find something for the public, -Saturn, not visible this time of year -Jupiter, not visible this time of year, I know, M13, quick enter into the computer on the scope. Something's not right, I don't need my light to see the buttons, I can even read the labels, more warning lights. Swing the scope over to the spot, reach over to grab the stool, didn't need my light to find the stool, another warning light. No M13 in any of the finder scopes, maybe the big scope can dig it out, by now, part of the song "nothing but blue sky do I see" is starting to play in my head. Quick enter in M52, nothing, cars are pulling in, find something, I know M31 Andromeda, blue sky, curse you blue sky, wait a faint smudge, success just a people are entering the room. With excitement they ask what I'm looking at, I'm tempted to snuffle my nose hold my flashlight under my chin and say "I see dead people", but then I realize the moon would ruin that too and discretion prevails.

We could look at that damn moon, almost full, no shadows across its face, mocking me. A clear calm cloudless night, perfect for viewing, and what two whole items in sky to view. If you were a waning or waxing moon I would consider you a friend. Another car is pulling up and I'll spend all night talking about you and M31.

Damn that moon, does one really need tides anyways. Police departments increase staff for full moons. Maybe I'll have better luck with the laser out on the deck pointing out all the constellations. Man it's bright out here; I can read the SkyNews out here, it's even brighter than in the dome. Something seems wrong with the laser, seems to be down on power, even worse most of the constellations and stars are missing. I hear a couple of fox's or coyotes' howling at the moon for ruining a night of stealthy hunting. Maybe when everyone leaves I'll join them in a howl. No wonder a Full Moon was made for howling.

Blair Stunder





Hi folks

Here are a couple photos before and after the slashing work Glen and Hugh and others have done. Thought you might be interested. Aug 28 and Sept 29, 2006.

Doug W.

Please note the darker area above and around the arrow.

This is where the brush fire was on the afternoon of June 25 2006. I received a call about 15 to 30 minutes after the fire was reported, when I arrived at the observatory at what would have been between 45 and 60 minutes after the first report to forestry. When I arrived they already had a fast attack crew on hand. They came in a Huey (Vietnam type) helicopter, with 7 firefighters. They had already been there for 15 minutes and were building a fire break to protect our building and the home next to us. They had already at that time dropped fire retardant from a water bomber. They dropped 4 times in all and my picture below right was on the front page of the Citizen.



Big thank you to forestry, they certainly know what they are doing!
We were lucky that day!



Transits of the Sun

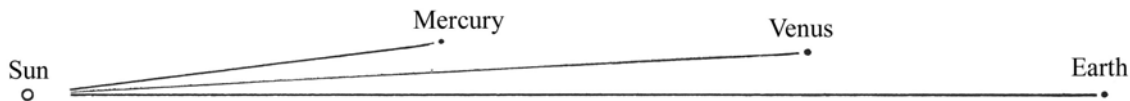
By Bob Nelson, PhD

Abell, Morrison and Wolff in *Exploration of the Universe*, define *transit* as “an instrument for timing the exact instant a star or other object crosses the local meridian. Also the passage of a celestial body across the local meridian; or the passage of a small body (say, a planet) across the disk of a large one (say, the Sun)”. We are concerned here with the last definition, more particularly with the transit of Mercury across the face of the Sun, which will occur next on Nov 8.

Transits of the Sun are possible, of course, only by the *inferior* planets – namely Mercury and Venus. Transits by Venus are quite rare -- there will only be two this century (and also the next), and, there are some centuries when none occurs! On the other hand, transits by Mercury are fairly common – there will be 14 this century, for example. Why is the frequency so different for the two planets and why don't transits occur each inferior conjunction?

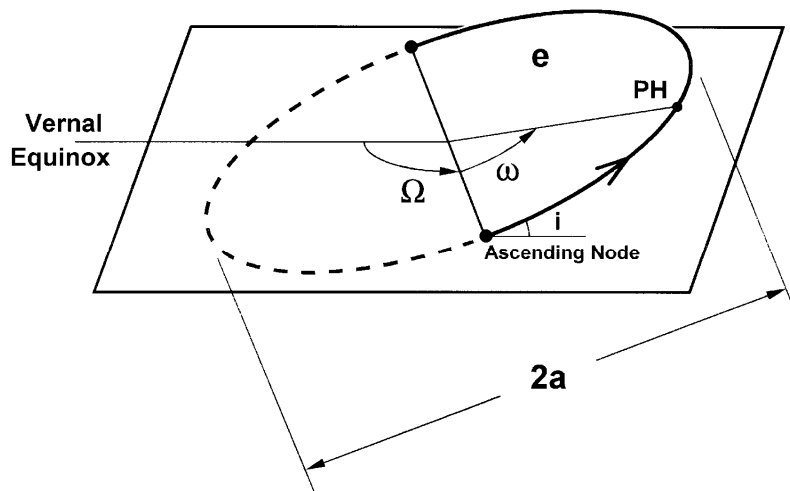
Well, I guess the first thing to realize is that the orbits of both planets are inclined to the *ecliptic*, (the latter is another word for the plane of the Earth's orbit). [We can be excused, I think, for being geocentric in outlook because we live here and must do almost all our observations from planet Earth! But I diverge.] The relevant facts are: the inclination of Mercury's orbit is 7.0047° ; that of Venus, 3.3946° ; their mean orbital radii are 0.3871 and 0.7233 AU, respectively. [1 AU = astronomical unit = average Earth orbital radius = 149,600,000 km.]

The next thing to realize is that the Sun is quite small in relation to the planetary orbits – its diameter is only 0.00465 AU. As viewed from Earth, the Sun's angular diameter varies from 31.512 arcminutes (occurring on or about July 6) to 32.584 (Jan 2). Therefore, if you draw things to scale, you see that it is only rarely that all three bodies (Sun, inferior planet and Earth) to line up sufficiently to cause a transit. (See the diagram below.)



Note that, although the size of the Sun is to scale, those of the planets are not.

Now, the orbits of the planets intersect the ecliptic at exactly two points – these are called *nodes*. See the diagram below for a diagram of the nodes (the prominent dots) and of the five elements of an orbit.



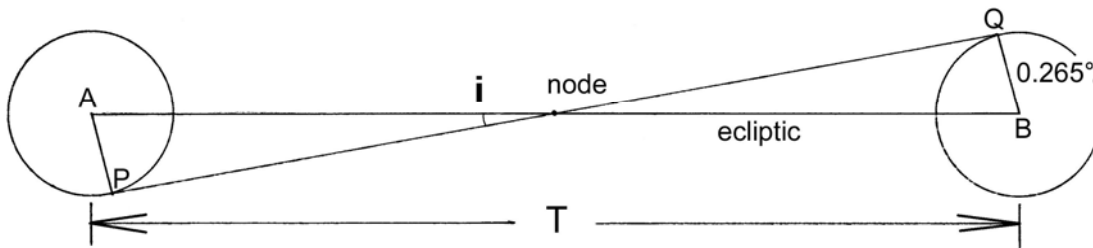
[Here, a = the semi-major axis, the effective radius of the orbit, e = eccentricity, and i = inclination. The names of the other two elements need not concern us here.]

Therefore, for a transit to occur, both the inferior planet and the Earth must lie along – or close to it – the line of nodes. (The limits are quite narrow.)

So here is my back of the envelope calculation (so to speak):

The synodic period (conjunction to conjunction) of Mercury is 115.88 days; in one century there are therefore $36524/115.88 = 315.2$ conjunctions. The corresponding numbers for Venus are $36524/583.95 = 62.5$ conjunctions per century.

Now what is the probability of a transit for a given conjunction? In other words, how close does the planet need be to the node? In order to see that, we need to look at the projection of the Sun and Mercury's orbit onto the celestial sphere (see below)



Line AB is the ecliptic (along which the Sun seems to move) and PQ is Mercury's orbit, which is just tangent to the Sun at either end. When the Sun is between points A and B, Mercury's orbit will lie across the Sun's face and a transit can occur (and will if Mercury is there). Now simple trigonometry reveals that quantity T is 4.35° ; this corresponds to 4.40 days (assuming a circular orbit for the Earth). Now what is the probability that Mercury will be within this zone for a given inferior conjunction? Why, it is simply $4.40 / 88.0 = 0.0500$ (where 88.0 days is Mercury's sidereal period – the time for one complete orbit, from one point in its orbit to the same point again). Then $0.0500 \times 315.2 = 15.8$ transits per century, on the average. This is not far off the actual number of 14 occurring this century.

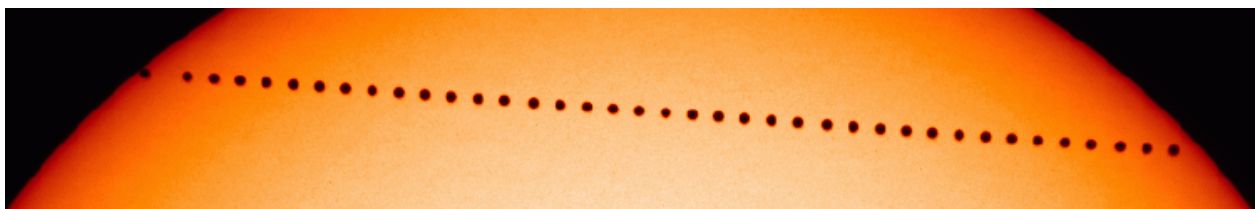
Similar calculations for Venus reveal the following: $T = 9.08$ days, probability = $9.08 / 224.7 = 0.0404$. Then there will be $0.0404 \times 62.5 = 2.53$ transits per century, on the average. This is not far off the value of 2 this century.

Note that the probability of getting a transit *for a given conjunction* is not that different, between Mercury and Venus. It is because the time between inferior conjunctions is much greater for Venus that transits are much rarer. [The latter fact, in turn, is because Mercury's orbital period is much shorter – it just whips around, passing Earth more than three times a year; in comparison, slower Venus has a conjunction only every year and a half.]

The exact calculations are much more complicated, of course, due mostly to the eccentricities of Mercury's and Earth's orbit (Venus' orbit is very nearly circular). However, this gives us an idea of what is going on.

By the way, read all the details of this month's transit in your 2006 Observer's Handbook, page 135 (one of the benefits of membership, eh?).

BN





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Prince George Astronomical Society Privacy Principles'

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When collecting personal information from our members, our groups, or supporters we will clearly identify in each case the specific purposes for doing so.

3. Consent

Consent to the collection of personal information for the identified purposes will be obtained before or at the time, the information is collected. In some cases, the party through the process of providing the information grants consent.

4. Limiting Collection

The collection of personal information will be limited to information that is necessary for the purposes identified by Prince George Astronomical Society. Information will be collected only by fair and lawful means.

5. Limiting Use, Disclosure and Retention

Personal information will not be used or disclosed for purposes other than those for which it was collected, except with the express consent of the individual or as required by law. It will only be retained for as long as necessary to fulfil the identified purpose, after which time it will be destroyed erased or made anonymous.

6. Accuracy



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The following lists the various situations where personal information may be collected and discusses the granting of consent, the purposes for collection, length of retention and disclosure of this information in each situation.