The Skyscraper
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the monthly publication of

The Amateur Astronomical Society of Rhode Island

47 Peeptoad Road
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www.theskyscrapers.org

See back page for directions to Seagrave Observatory.

Please submit items for the newsletter by June 15 to Jim Hendrickson, 1 Sunflower Circle, North Providence, RI 02911 or e-mail to jim@distantgalaxy.com

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The Skyscraper

June 2004

June Meeting

Friday June 4, 7:30pm at Seagrave Observatory

Our speaker for this evening will be: Dr. Edward Deveney of Bridgewater State College. This will be a "not quite" astronomy presentation, but promises to be interesting and entertaining all the same.

The title of his talk will be: "Quantum Reality, Spooky Action and the Scientific Method...The Score is: Quantum Mechanics 1, Einstein 0."

He recently gave a presentation at the request of our own Bill Luzader at the planetarium Bill runs in Plymouth.

If interested, I invite you to visit his website:
http://webhost.bridgew.edu/edeveney/e-f-deveney-home

Dr. Deveney received his PHD from the University of CT in 1993 and likes to investigate atomic and molecular structure and electronic interactions using collisions smashing atoms. "The knowledge of collisions and how electrons behave themselves during collisions is integral in understanding parts of the universe made from atoms, ions and molecules- from chemical reactions here on Earth to the spectroscopy of planetary atmospheres and astrophysical plasmas."

Skyscrapers Calendar

Public observing is held every Saturday at Seagrave Observatory weather permitting and when the grounds are accessible.

June 4 Friday	**7:30pm**	**Monthly Meeting** at Seagrave Observatory
June 5 Saturday	**dusk**	**Public Observing Night** at Seagrave Observatory
June 12 Saturday	**dusk**	**Public Observing Night** at Seagrave Observatory
June 19 Saturday	**dusk**	**Public Observing Night** at Seagrave Observatory
June 26 Saturday	**8:30am**	**Trip to Oak Ridge and Mystery Hill** leaving from Seagrave Observatory
	dusk	**Public Observing Night** at Seagrave Observatory

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President's Message

Dan Lorraine, President

On Saturday June 26 Skyscrapers members, family, and friends are invited to participate in another exciting field trip! Our first stop will be Harvard University's Oak Ridge Observatory where we will receive a private tour of the facility. The Oak Ridge Observatory, in Harvard, Massachusetts, operates the largest optical telescope east of Texas in the U.S. It is a facility of the Smithsonian Astrophysical Observatory (SAO), which is part of the Harvard-Smithsonian Center for Astrophysics (CfA). The Wyeth 61-inch reflector carries out research on stellar radial velocities and the motions of comets and asteroids. The Wyeth telescope is also involved in the Optical Seti project where a high-intensity pulsed laser, teamed with a 61" telescope, forms an efficient interstellar beacon. To a distant observer in the direction of its slender beam, it would appear (during its brief pulse) a thousand times brighter than our sun. Beginning October 19, 1998 they have been searching for such intense laser pulses, transmitted deliberately in our direction by another civilization in order to initiate communication across interstellar distances. In addition to the Wyeth telescope and several other optical telescopes, an 84-foot steerable radio telescope is now being used in Project BETA, a search for extraterrestrial intelligence.

From Harvard Massachusetts we will drive to North Salem New Hampshire, where on a hilltop sits an enigma and mystery that has baffled researches for decades. Known as America's Stonehenge, Mystery Hill is a complex of stonewalls, stone chambers, and standing stones. From central observation points, the stones are aligned to significant astronomical events such as solstice sun rises and sunsets, equinox sunrises and sunsets, and many more much like the great megalithic observatories of Europe. Who built this site? Was it the Indians? The colonists? Or other ancient cultures that journeyed to our shores in pre-historic times? Join us on the trip and decide for yourself. Member Rick Lynch, an expert on New England pre-history and the Indian Nations of the Southwest will guide our tour. Rick is the President of an international organization called The New England Antiquities Research Association (NEARA) and sits on the board of directors at the Massachusetts Archaeological Society and Brown University's Haffenreffer Museum.

We will meet at 8:30 am at Seagrave Observatory where we can car pool to these sites. The ride is approximately 90 minutes each way. Please bring a picnic lunch that we will eat when we get to Mystery Hill since they only have a snack bar that serves candy and other snack type items. Moderate walking is required at Mystery Hill and a small entrance fee of $5 if we get a group of 20 or more; otherwise it's $8.50 for adults or $7.50 for seniors.

And don't forget to support our friends at the Astronomical Society of Greater Hartford (ASGH) by attending their annual event called Star Conn on Saturday June 5. They have an impressive lineup of speakers covering a wide variety of topics. The cost for the day is $15.00. For those interested in attending, we will be car pooling from Seagrave Observatory – departure time will be 7:45 am.

Transit of Venus: A Rare Astronomical Event

David A Huestis, Historian

I think the astronomers of the first years of the twenty-first century, looking back over the long transitless period which will then have passed, will understand the anxiety of astronomers in our own time to utilize to the full whatever opportunities the coming transits may afford; and I venture to hope that should there be found, among the old volumes on their book-stalls, the essays and charts by which I have endeavored to aid in securing that end (perhaps even this little book in which I record the history of the matter), they will not be disposed to judge over-harshly what some in our own day may have regarded as an excess of zeal.

So wrote Richard Proctor (1837-1888), in the concluding paragraphs of his 1875 book, Transits of Venus. Proctor was a prominent astronomer and prolific writer on the subject of astronomy. For me, he apparently gazed not only into the heavens but also into the future as well. For when I began to research the upcoming transit of Venus across the face of the Sun on June 8, I immediately scanned my bookshelves for works published in preparation for the more recent transits of 1874 and 1882.

I knew I possessed Proctor's above mentioned work, for I had only recently acquired it from another amateur astronomer friend who knew I liked Proctor's writings. It's an increasingly difficult volume to locate at a reasonable price in good condition. My initial research into Venus transits came from reading this work. I also located another antiquarian book from the same time (1874) that was extremely technical, plus three more recent works that were entirely devoted to transits of Venus and Mercury.

Most books on astronomy have a small section on solar transits, but the works I referenced contained a wealth of information, more than suitable for me to provide a brief historical perspective on the topic, plus prepare you for the upcoming experience that no one living today has ever witnessed.

Let's first explore what a transit is. Simply stated, an astronomical transit occurs when one celestial object, such as a planet or a moon, passes in front of another celestial object. If you think about it, technically a solar eclipse is really a transit of the Moon across the face of the Sun! We just have another name for it!

But, let's extend that analogy a little further. The moon passes between the Earth and Sun and occasionally we observe a solar eclipse. Sometimes it's a partial, sometimes it's a total, and most times it doesn't occur at all. It all depends upon the alignment of these three bodies! But why don't we get a solar eclipse every new Moon? We would if the Moon's orbit wasn't tilted or inclined at an angle to the Earth's orbit around the Sun. If all things were perfect, we would see a total solar eclipse and a total lunar eclipse every lunar month. It would be so routine we probably wouldn't pay much attention to it.

Well, when it comes to transits of Venus and Mercury across the face of the Sun, a similar principle applies. Since both planets occupy orbits between the Earth and the Sun it stands to reason that they would more than likely be seen to pass in front of the solar disk from time to time. Again, though the planets in the solar system (except Pluto) pretty much lie in the same flat plane, the orbits may be inclined either above or below the plane of the Earth's orbit.

So, as is the case with Mercury and Venus, when they pass inferior conjunction (between us and the Sun), sometimes they pass above or below the solar disk as seen from the Earth. (This concept is simply stated here, but it took the greatest astronomical minds of the past to figure it all out. It was a great mystery to be solved, and it took much observation, dedication and deduction to pull it all together into the solar system layout we have all come to know.) Like the Moon, the orbits of Mercury and Venus are also inclined slightly in relationship to the Earth's orbit. While Venus' orbit is more circular, Mercury's is more eccentric and inclined at an angle almost double that of Venus. With Mercury also closer to the Sun than Venus, its passages across the solar disk are therefore more likely to occur!

What effect does this have on the frequency of transits for both of these planets? Well, for Mercury between 1907 and our current day there have been 15 transits. Not very rare. In fact, on May 7 of last year we were well positioned here in New England to watch a portion of a Mercury transit. Unfortunately we were clouded out. Though a firsthand look is much better than watching an event on a television or computer screen, I did watch the event on the web from several locations,

including the Canary Islands, South Africa, Hong Kong and Australia.

When we talk about a transit of Venus, we are talking about a very rare astronomical event indeed (only 81 will occur between 2000 B.C. and A.D. 4000). This rarity is due to Venus' nearly circular orbit and its inclination. When the calculations are performed, Venus transits usually come in pairs (like Mercury), but the interval between the second one of the pair and the next one is generally 122 years.

On June 8, Venus will transit the Sun for the first time since 1882. No one alive today has ever witnessed this event. Though I believe there is no new knowledge we can obtain from such an event, professional and amateur astronomers alike have been anxiously awaiting this rare occurrence. Like the old days when scientific expeditions were sent worldwide to observe these transits, today some folks will still travel to far away lands to be ideally situated to watch the event in its entirety. I and fellow Skyscraper members will be content to observe this twice in a lifetime (the second transit of this pair occurs on June 5/6, 2012) event from right here in Rhode Island. (A quick note: Seagrave Observatory will not be open to the public for this years' transit. Since the transit occurs with the Sun very low in the early morning sky, our tree studded eastern horizon will prevent any observations from Seagrave.)

Before we get to the local circumstances for this transit and how to safely observe it, we first should examine why transits of Mercury and Venus were thought to be so important. Astronomers were trying to determine the mean distance from the Earth to the Sun, known as the astronomical unit (AU).

It all began with the recording of planetary observations by German astronomer Johannes Kepler. Though his tables predicted the Venus transit of 1631, we have no record of any observations of that event. You will recall that the transits usually occur in pairs, but Kepler's tables did not predict one for 1639. Along came English astronomer Jeremiah Horrocks who noted some errors in Kepler's tables. When he corrected them he determined a transit of Venus would happen on December 4, 1639. He notified a friend, William Crabtree, from a nearby village, and it seems they are the only known individuals to have witnessed the transit that year. Some poor planning and bad weather prevented them from viewing the entire event. Some observations were noted, but very little scientific information was forthcoming.

Once the Sun was accepted as the center of the solar system with the planets revolving around it, astronomers knew the order of the solar system but they did not know the scale. Some estimates had been made, but they were not very accurate.

Edmund Halley, in 1716, devised a method of timing a transit, noting the exact time the planet entered the solar disk, and the time it exited the solar disk. By positioning observers around the world to make precise measurements and timings, one could calculate the solar parallax. This measurement is an apparent shift in the position of Venus' transit across the disk of the Sun due to it being observed from different locations on the Earth's surface. It had been determined that Mercury's transits, though more frequent, could not be used because the planet's shift in position from one location to another was too small for accurate measurements.

Halley knew he would be dead before the next transit occurred, so sent his proposal to others who would hopefully execute the experiment in 1761. For the transit of June 6, 1761, Halley's method was chosen to hopefully obtain accurate data to define the scale of the solar system.

As luck would have it, many of the observations were foiled by bad weather in 1761 and also again in 1769 (some things never change). Also, a phenomenon called the "black drop" effect made getting precise timings nearly impossible.

The black drop effect is something I am anxious to observe this June. As the black disk of Venus begins to cross the limb or edge of the Sun, it is a perfectly round dark spot - more black and more round than any sunspot. Just as Venus is about to fully enter (2nd contact) or begins to exit (3rd contact) the solar disk, a portion of the planet seems to elongate outward toward the blackness of space along the Sun's limb (see accompanying graphic detail). It looks like an drip about to detach itself from a faucet, or like the shape of a teardrop.

The effect can last for several seconds, depending upon atmospheric conditions, preventing astronomers from obtaining precise timings of the beginning (ingress) and ending (egress) of the transit. Observations differed greatly, thereby throwing the calculations off by millions of miles.

Here in the colonies during 1769, some of the first notable astronomical observations were made during the transit of Venus. Joseph Brown, a prominent citizen in the Providence community, learned of the upcoming event and sent for a telescope and other equipment from England. It arrived about one month before the transit. (This same instrument can be seen today in the John Hay Library at Brown University.) Much preparation ensued to accurately determine the precise latitude and longitude of the site from which they would observe the

transit. This fact was critical if the solar parallax was to be determined and hence the calculation of the astronomical unit. As reported in Florence Parker Simister's book, Streets of the City: An Anecdotal History of Providence, Brown set up a temporary observatory "on the crest of a hill one hundred feet to the east of Benefit Street between what is now Governor and South Water Streets, at the southern end of Thayer."

Cloudless skies prevailed that June 3, 1769. Simister writes, "Crowds of curious spectators, and those interested in scientific matters, gathered at the observatory while Governor Stephen Hopkins, Dr. Benjamin West and Joseph Brown looked through their instruments and made their calculations."

Though the observations from Providence fell in line with observations made elsewhere, the scatter due to the black drop effect still produced an unacceptable error. Regardless, the Providence scientists did produce valuable results which not only were published "in the Transactions of the American Philosophical Society", (as noted by Steven F. Crump, Jr, in a Rhode Island History journal (VOL 27, January 1968) article entitled, Joseph Brown, Astronomer) but also were well received by the Astronomer Royal of Greenwich, England.

Unfortunately Halley's method never proved successful. Other methods eventually provided the correct answer. Even during 1761/1769, when Halley's method was preferred, a French astronomer named Delisle proposed a simpler method. One only had to time either the ingress or egress of the transit, not time the entire event. Unfortunately one had to know the precise location of the observer on the surface of the Earth for Delisle's method to work.

Latitude was easy to determine, but longitude at sea in those days was not. If you read the book Longitude by Dava Sobel, or watched the PBS production, you know that only with precision-regulated clocks could one accurately determine longitude. John Harrison's precision pocket watch was successfully tested in 1764, and only in 1772 did he win a coveted prize of 20,000 pounds and recognition for his handiwork.

For all intents and purposes, the use of transits to determine the scale of the solar system proved fruitless. The expeditions to far away lands did provide valuable scientific discoveries in other disciplines, not to mention the exploration of our world. For example, if you want to follow-up on just one of these expeditions, read about Captain Cook's voyage and his involvement with the transit of 1769. A quick hint: he may have thrown some gruel on the barbie!

During the transits of 1874 and 1882, photography was the new method of acquiring data to determine the solar parallax and to make other discoveries. However, simpler methods had already revised the AU to unparalleled accuracy, and although scientific expeditions were still funded for the purpose of research, very little new information was forthcoming. The one thing that did arise from the 1882 event was an increased interest and excitement of the event by the general populace. Will this happen in 2004?

Let's now look at the circumstances for 2004's upcoming transit of Venus on June 8 (see accompanying graphic). Unfortunately we will not be able to view the entire event from here in southern New England. Folks in Europe, Asia, and most of Africa have the best seats in the house. I understand a few spacecraft will be observing the transit as well. Halley would be envious!!

The transit of Venus begins at 5:13 UT (universal time; also known as Greenwich Mean Time). We are four hours behind UT, so at 1:13 a.m. EDT, the Sun is obviously below our horizon. By the time the Sun rises for us - 5:11 a.m. EDT, the transit will be well in progress. Give the Sun a few minutes to rise above the horizon, though you may be able to see Venus' silhouette even before the Sun fully clears the horizon. From that point until 7:26 a.m. EDT, we will be able to follow the transit through its completion. Look for the black drop effect just before Venus begins to exit the solar disk, around 7:06:31 a.m. EDT. Reference accompanying graphic with detail insert once again.

Now, several words of caution are necessary to state here. Do not stare or take occasional glimpses at the rising Sun without protection! Just because the sunlight may be dimmed by the dense atmosphere when the Sun is low on the horizon, do not be tempted to stare at it. Number 14 welders glass is one safe method to use. DO NOT use exposed film of any kind. This method is not safe. In past columns I have instructed folks on how to build a solar eclipse viewer using a shoe box. This observing method won't work in this circumstance. The projected solar disk is so tiny that Venus' dark silhouette would hardly be noticeable. Also, with the Sun so low, it may not be bright enough to project a reasonable image.

Only if you are an experienced solar observer should you attempt to observe the transit with a properly filtered telescope or use the solar projection method. If you have never observed the Sun before this event, don't start now! Don't risk your eyesight due to an oversight or an outright mistake. Even if you have one of those department store refractors that often come with small glass or plastic filters, do not be tempted to use them. They have been known to shatter when exposed to the Sun's concentrated image. If you use the Sun projection method (using a telescope to project the Sun's image on a white screen), remember to be very cautious if other

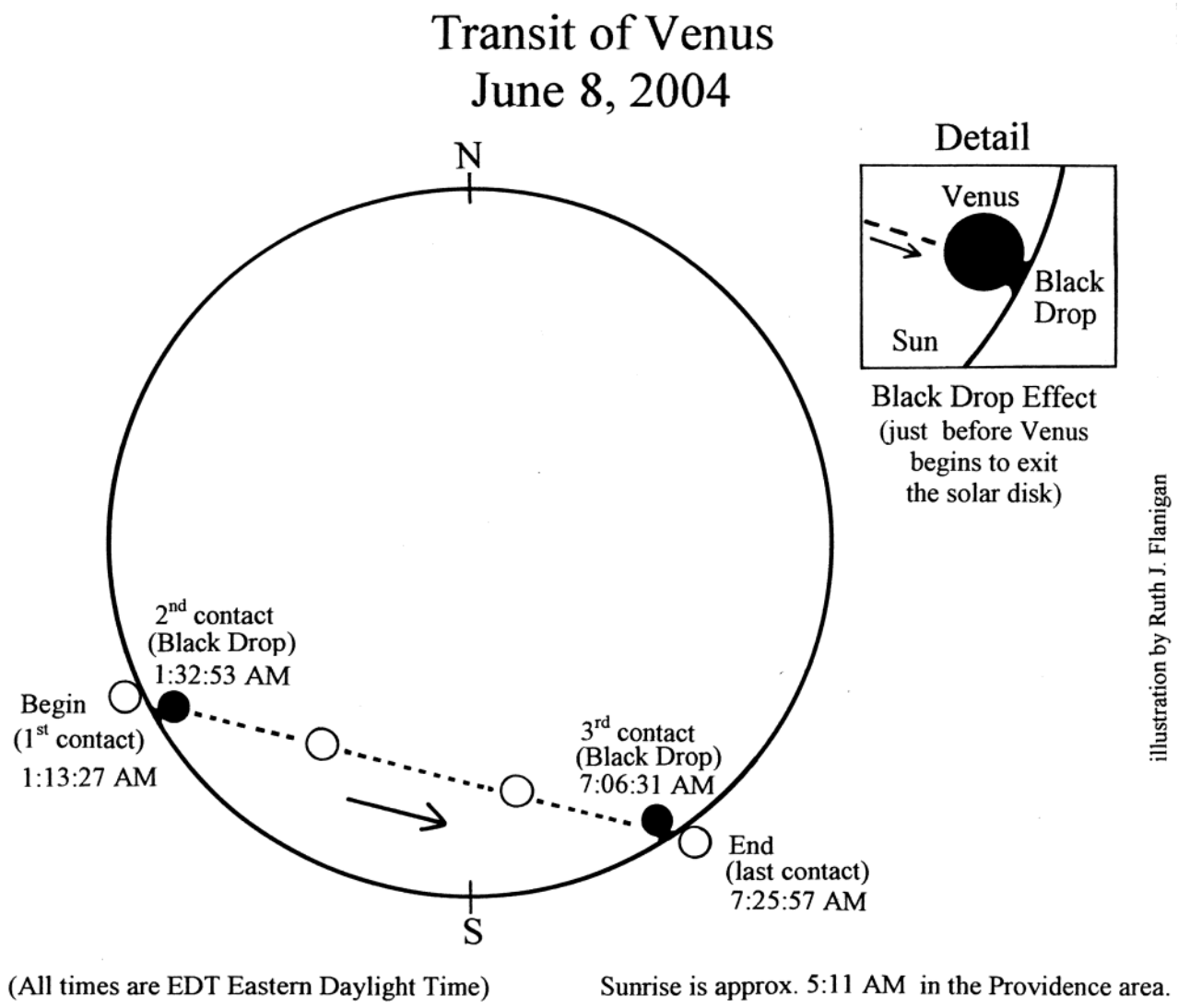
folks, especially children are nearby. You don't want anyone accidentally stepping up to an unguarded eyepiece to take a look. And regarding eyepieces, do not use cemented eyepieces. Use air-spaced ones. Eyepieces have been ruined when the cement has melted due to the concentrated light collected by a telescope. Also, remember to block off your finder scope. I have seen observers singe their hair or clothes by failing to do so!!

Think about what a small magnifying glass can do, then imagine the intensity and heat a larger telescope can focus. It's not worth it. Many years ago, when I first started out in astronomy, I had one of those glass/plastic filters shatter during a partial solar eclipse. Luckily I wasn't looking through the eyepiece at the time.

I'm sure there will be some web sites available from which you can safely watch the event. Surf the web ahead of time to see what sites will be offering this great event. Here's one that plans on providing 200 mirror sites to satisfy the demand - http://www.vt-2004.org/central/. I agree that this method is not the same as experiencing it firsthand, but if you can't observe it safely, don't observe it at all. If all else fails, and I mean the weather, you may have no choice but to pull up a chair in front of your computer screen to watch the progress of the event. In fact, before the Sun rises for us here, I will be monitoring the transit on the web. We can only hope we will have our opportunity to see an extremely rare event no one alive today has ever observed.

Good luck in whatever observing method you choose, and remember to keep your eyes safe.

And, just in case you're wondering what the current value of the astronomical unit (mean Earth-Sun distance) is, it's 92,958,348.76 miles, plus or minus about 90 feet!



(All times are EDT Eastern Daylight Time)

Sunrise is approx. 5:11 AM in the Providence area.

Secretary's Report

Skyscrapers Executive Board Meeting

Saturday May 8, 2004
Seagrave Observatory

Skyscrapers Executive Board Meeting
Saturday May 8, 2004

Attendees were: Dan Lorraine, Steve Hubbard, Rick Arnold, Pat Landers, Ted Ferneza, Jim Hendrickson, Ken Dore, Dave Huestis, Bill Kirby, Jack Szelka, Dawn Burdick and Joel Cohen

Dan opened the meeting with the topic of Insurance coverage. Rick Arnold will follow up with his insurer.

Dan, Jim, Pat Landers, and Bill Kirby will work to consolidate our database.
Emailing the newsletter to most of the membership will result in an expected savings of about $800 annually. Any member that would still prefer a hard copy mailed to them could request so.

Ted Ferneza will send a broadcast e-mail to announce the change in the clean up date and to recruit additional help. Projects on Ted's list for this year include renting a dumpster to remove larger discarded items dumped on the property over the years. It was voted to include the electric toilet in the items to be disposed of. Dan and Jack Szelka will check prices on dumpsters.

Jack will inspect the double roll-off building. Jack also said he would spray the buildings where necessary for insect control. Jack further stated that in the Clark building, he would inspect the masonry.

Ted also reported that he has engaged the services of our neighbor to mow our lawns at a slightly increased rate over last year. There was some discussion on the state of our lawns, grass growth, concern with possible soil erosion and the formation of ruts. It was decided to wait and see how the lawn recovers during the next month.

Plans were discussed to explore the possibility of adding some additional land to Skyscrapers present site in order to trim back trees for better horizons.

We discussed writing another grant proposal to expand our present meeting hall while adding a bathroom facility and kitchenette area to submit to the Champlin Foundation. Jack and the trustees will start to pull some construction issues and estimates together before we start the grant writing process.

Dan reported that Bob Horton has a well-organized plan of action for recruiting speakers for AstroAssembly. Some speakers have been engaged and others are close to accepting our invitations. No speakers are ready to be formally announced. It was agreed that Bob is doing an excellent job at organizing the speaker line up for AstroAssembly.

Now that the budget for an LCD Projector has been increased to the $1,800-$2,000 range, Dan asked that we come back with specifications on brands and models from which we may make a selection for purchase.

Dan reported that he was able to purchase the Starry Night Pro software package for less than $116.99 with free shipping on Amazon.com.

We discussed venues to use in advertising the sale of the Ash Dome. Both e-bay and AstroMart were preferred. A minimum price was set at $2,000.00. Dan will ask Bob Horton to post the ad.

Dan reported that he had received a request from the Rhode Island Cub Scout Council that Skyscrapers membership provide volunteers to staff a recurring program at their camp in Burrillville during the month of July. Ted will send out a broadcast e-mail so we can respond by the June meeting and Jim will post the letter on the web.

Steve listed upcoming speakers for June through September.

Bill suggested we access the RI Board of Education or the RI Teacher's Association web sites to acquire a list of science teachers and through them reach more students.

Directions to Seagrave Observatory

From the Providence area:
Take Rt. 6 West to Interstate 295 in Johnston and proceed west on Rt. 6 to Scituate. In Scituate bear right off Rt. 6 onto Rt. 101. Turn right onto Rt. 116 North. Peeptoad Road is the first left off Rt. 116.

From Coventry/West Warwick area:
Take Rt. 116 North. Peeptoad Road is the first left after crossing Rt. 101.

From Southern Rhode Island:
Take Interstate 95 North. Exit onto Interstate 295 North in Warwick (left exit.) Exit to Rt. 6 West in Johnston. Bear right off Rt. 6 onto Rt.101. Turn right on Rt. 116. Peeptoad Road is the first left off Rt. 116.

From Northern Rhode Island:
Take Rt. 116 South. Follow Rt. 116 thru Greenville. Turn left at Knight's Farm intersection (Rt. 116 turns left) and follow Rt. 116. Watch for Peeptoad Road on the right.

From Connecticut:
- Take Rt. 44 East to Greenville and turn right on Rt. 116 South. Turn left at Knight's Farm intersection (Rt. 1116 turn left) and follow Rt. 116. Watch for Peeptoad Road on the right.
- Take Rt. 6 East toward Rhode Island; bear left on Rt. 101 East and continue to intersection with Rt. 116. Turn left; Peeptoad Road is the first left off Rt. 116.

From Massachusetts:
Take Interstate 295 South (off Interstate 95 in Attleboro.) Exit onto Rt. 6 West in Johnston. Bear right off Rt. 6 onto Rt. 101. Turn right on Rt. 116. Peeptoad Road is the first left off Rt. 116.

47 PEEPTOAD ROAD
NORTH SCITUATE, RI
02857