BPAA Newsletter

Battle Point Astronomical Association, Bainbridge Island, WA

Issue 67 January-February 2005

JANUARY-FEBRUARY-MARCH CALENDAR

(Unless otherwise noted, all events are at the Edwin Ritchie Observatory, Battle Point Park)

January

January 2: Earth at Perihelion (0.983 AU from the Sun)
January 3: Quadranitids Meteor Shower Peak
Last-quarter Moon
January 5: BPAA Board Meeting 7 p.m.
January 8: Star Party Battle Point Park
Beginner session 5 p.m.
January 10: New Moon
January 12: BPAA **Annual Meeting** 7 p.m.
ALL MEMBERS INVITED!
January 17: First-quarter Moon
January 25: Full Moon

February

February 2: BPAA Board Meeting 7 p.m.
Last-quarter Moon
February 5: Star Party Battle Point Park
Beginner session 6 p.m.
February 8: New Moon
February 9: Member Meeting 7 p.m.
February 15: First-quarter Moon
February 18: 75th Anniversary (1930)
Clyde Tombaugh's Discovery of Pluto
February 23: Full Moon

March

March 2: BPAA Board Meeting 7 p.m.
March 3: Last-quarter Moon
March 5: Star Party Battle Point Park.
Beginner session 6 p.m.
March 9: Member Meeting 7 p.m.
March 10: New Moon
March 13: Percival Lowell's 150th Birthday (1855)
March 17: First-quarter Moon
March 20: Vernal Equinox
March 25: Full Moon

CALENDAR NOTES

The bright winter constellations Canis Major, Gemini, Orion, and Taurus are now high in the sky. You may wonder why I bother to point this phenomenon out, based on the weather the past several months. I could, perversely, point out additional phenomena you will no doubt miss, should the current weather pattern persist. For example, very early in January, all five naked-eye planets will be visible just before sunrise: Mercury, Venus and Mars to the southeast, Jupiter to the south, and Saturn to the west. This opportunity will not happen again until 2016. Too bad you'll probably miss it.

Then there's Comet Machholz. You probably won't see that either. I have to admit we've managed to catch a couple of glimpses of it in December before the fog or the clouds or both rolled in. In January, it will be at about a magnitude 3.6 or 4.0, naked eye visible. Close to the time of the New Moon, on January 7 – 8, Comet Machholz will pass 2 degrees west of the Pleiades. It will also be closest to Earth at that time, 0.35 AU. By the way, the comet was discovered by Don Machholz of Colfax, California, with a 6-inch f/8 reflector! Amazing what you can do in skies that actually clear.

And don't count on seeing the Quadrantid meteors either, one of the most intense meteor displays of each year. The 2005 peak is on January 3 in the predawn, when there may be as many as 40 or more meteors per hour.

The probable lack of viewing opportunities should give you time to attend BPAA's Annual Meeting. It is scheduled for January 12, starting at 7:00 p.m. All members are invited. Member meetings are scheduled for February 9 and March 9. Speakers and agendas will be announced via our email yahoogroup.

Note that our monthly star party in January is scheduled for 5:00 p.m., but that, with the passing of the Winter solstice, the star parties in February and March will begin at 6:00 p.m. Further, to avoid conflict with the New Year's holiday, the January star party is on January 8, close to the time of the new moon. The others (February and March) are scheduled, as usual, to coincide with the third-quarter moon.

Should the skies miraculously clear, additional star parties may be scheduled at any time via our email yahoogroup. Any member who plans to observe can invite others to join in by sending an email to bpaa@yahoogroups.com. To join our email group, send an email with your name to bpaa-owner@yahoogroups.com and we will enroll you. If you want to also have web access to the messages and files, you can join the yahoogroups by clicking the register link for new users on http://groups.yahoo.com/ and requesting to join our group at: http://groups.yahoo.com/group/bpaa/. The system will send us a message, and we'll approve your request after we verify your membership.

Diane Colvin, *BPAA Events Director* (dtcolvin@comcast.net)

IN BRIEF

President's Message

Paul Below

As I write this, on New Year's Day, it is cloudy. Again. Somewhere up there above the clouds, ringed Saturn has returned to our early evening sky. In the south, the glorious Orion Nebula is shining with reflected light from young stars. Overhead, distant galaxies shine with the combined glow of millions of stars. And, up there somewhere, a naked eye comet is moving northwards and getting brighter. But, due to our winter weather, we are unable to share these sights with students and adults.

What if we had a magic room that allowed us to virtually transport people to a clear sky location where they could see these things, in a realistic simulation? What if we could actually schedule an educational event in advance and count on being able to observe the sky?

I am pleased and excited that committee members are able to provide you with updates on the Planetarium Project in this issue. A number of people have worked long and hard, and as you can see a lot of thought has gone into it. In 2005 we will decide on the details of what BPAA is going to attempt to do. To use an opera metaphor, the overture is ending, and the curtain is about to rise on the first act. For baseball fans, the lineup cards are being brought out to home plate and we await the first pitch.

About a dozen of you have stated your commitment to learning to operate a planetarium projector, and teach others. This addresses one of the concerns that we have had – if we build it, who will operate it?

With our own facility (possibly portable as well as permanent), we would not only be able to present programs ourselves, but we could also train local teachers to enable them to more effectively bring astronomy to their classes.

Training teachers partially addresses another concern: if we build it, will they come? Public events such as beginner sessions or weekend shows will also put the facility to good use. We hold a number of educational sessions for local scout groups during the year. A planetarium would give us the all-weather "magic room" I mentioned in the second paragraph to demonstrate the workings of the night sky to the scouts.

A permanent facility will require us to raise a large amount of money. Rest assured that BPAA will not go into debt. I have tried to follow guidelines established by my predecessor, our founding President Mac Gardiner. Mac always told us that we should buy quality goods, and if we didn't have the money to buy quality goods then we would buy nothing. BPAA relies on member dues and donations for operating funds, and borrowing money would be a risk we should not take. Therefore, the money for a permanent structure must be acquired before construction can begin (and of course we must obtain necessary approvals and permits). And this is where the efforts of many of you will determine success or failure.

I hope that you can join us for our BPAA annual meeting on January 12 at 7 p.m. We have some necessary business to attend to, some accomplishments to celebrate, and much to look forward to in the New Year.

Near-Earth Asteroid 2004 MN4 Reaches Highest Score To Date On Hazard Scale. Is the End of the World Coming?

Harry Colvin

Well maybe on Friday the 13th, 2029. The near-earth asteroid 2004 MN4 was discovered on June 19 of this year by Roy Tucker, David Tholen and Fabrizio Bernardi of the NASA-funded University of Hawaii Asteroid Survey (UHAS), from Kitt Peak, Arizona, and observed over two nights. The asteroid had been given the highest risk rating of two on the Torino scale of 1 to 10, a 1 in 300 chance of earth impact. But as we go to press, new orbit predictions place the chance of earth impact at 1 in 43 and the rating has been increased to four on the Torino scale. Based on brightness measurements, 2004 MN4 is estimated to be 400 meters across. All predictions of size, however, are being hotly debated on the Minor Planet Mailing List (MPML) yahoo-user group. For asteroid hunters, amateur and professional alike, this will be the discussion place to be: 2004 MN4 becomes closer and brighter over the next two weeks, when less light inference from the moon will allow for more exact measurements. Will the asteroid be visible from the Pacific Northwest? Yes, and no. Currently it is low on the horizon in the vicinity of the constellation Sculptor and moving fast. At magnitude 18 you will need a very large telescope or a CCD camera and a clear night (not likely) to detect it. You can plot its position and direction of movement with Cartes du Ciel software. Good luck on finding it and good luck on Friday 13th, 2029 if you are still around.

Seeing Stars: Astronomy 0.001—The Tropic of Capricorn

Anna Edmonds

Our Sun reached its farthest southern point, the Tropic of Capricorn, at 4:32 a.m. PST on December 21 this year and has since begun its six-month swing back into our northern sky. We know that the coldest part of winter is still ahead of us, but from experience we also have hopes that the Sun is beginning to end its hibernation.

This tropic has little to do with sun and warmth.Tropic comes from the Greek word tropos meaning turning. The Sun turns north if it's at the Tropic of Capricorn, or south if it's at the Tropic of Cancer in its yearly sashay between these two points. Thus the Tropic of Capricorn is the imaginary line traced by the Sun as it circles the Earth east to west at 23 ½° South. This is the latitude at which the Sun is directly overhead at noon in the southern hemisphere on the shortest day of the year for us in the north. This latitude is as far south as the Sun ever moves; from here it turns north until it reaches the opposite Tropic of Cancer in June.

The area between these two Tropics has no significant temperature variation over the year because the Sun is always overhead. From this comes the reason it is "tropically" sultry. We on Bainbridge experience the changing seasons caused by the Earth's tilt because we're well north of both Tropics.

The moment that the Sun reaches 23 ½° S is called the winter solstice—the time in December when the Sun appears to stand still. Years ago this was when people wondered if spring would ever come, or if they were doomed to eternal darkness and cold.

The apparent movement of the Sun in relation to the stars over the seasons is due to Earth's tilt of 23 ½° in its axis of rotation around the Sun.

This tilt, plus the effects of the pull of gravity on the Earth from the Sun and the Moon and its daily revolution cause it to wobble slowly (every 26,000 years) and smoothly in its orientation to the stars, a bit like the wobbling of a top.(But the Earth doesn't fall down like a top does.) This wobble is called the precession of the equinoxes.

And Capricorn? Likewise it now has little to do with marking the season. It's the constellation known as "The Goat," the tenth sign of the astrological zodiac. In the 2nd century BC the astronomer Hipparchus observed that the apparent position of the Sun at the winter solstice was in this constellation. He identified it as such, and the name has stuck ever since. The Earth, however, has not stayed stuck; it's precessed, so that now the Sun is in a different constellation, that of Gemini, on December 21. In another two thousand years the solstice will have continued to disregard astrologers and have moved on to Taurus.

For the Romans in the time of the Caesars, the winter solstice was the Saturnalia holiday. It originally was a one-day—December 17—event honoring Saturn as the god of sowing. Then it expanded into a week's festivities culminating in the festival of Sol Invictus (the Uncon-

quered Sun) on December 25. They exchanged gifts during this week, wished everyone peace and prosperity, plowed the ground, and sowed their seeds.

December was the tenth and last month of the Roman calendar. Romans drew a parallel between the birth of a baby in the tenth month after its nine-month gestation, and the hope that the Sun would waken from its snowy hibernation and create new life during this December celebration.

DSL at Ritchie Observatory

The Observatory now has DSL internet access, thanks to the generous donation of Sheri Watson and David Jackson of Sound DSL/Day City Internet. We can now be confident of getting an accurate time signal, which is necessary for precise alignment of telescopes, and incorporate the vast resources available on the internet into lectures and discussions at the observatory. While this was possible in principle in the past, it was not practical due to the very long download times over the old dial-up modem.There are several computers available in the meeting room on the ground floor, the library on the second floor and in the dome. These computers are networked so they can easily share resources, and they all have access to the DSL internet connection. In addition we have wireless access to the network.

How's the Big Telescope?

The Ritchie telescope is undergoing a control system upgrade. This includes replacing the control software, the motor control boards, the motors and the motor mount assemblies. The new control system will be the program *Scope*, developed by Mel Bartels. See http://www.bbastrodesigns.com/ for a detailed description of this software and related hardware. We will be installing servo motors instead of keeping the current stepper motors. This allows us to use the newer version of the program (*Scope II*) which is substantially better. Changing to servo motors should also help reduce vibration. The change requires new mechanical motor mount assemblies, but these must be redesigned and replaced anyway: the current assemblies are the largest single source of slop in the control system. Designing and building these mechanical components will be the most difficult and time consuming aspect of this project.

Help is welcomed. Currently the greatest need is for persons with machining and/or mechanical engineering skills. If you are interested, contact me.

—Malcolm Saunders

ARTICLES

Dreaming Big

Sally Metcalf

The Planetarium Committee has been hard at work since spring dreaming, scheming, researching, and planning. We've tackled some astronomical problems, and will soon be presenting our proposal to the BPAA Board. If the board approves our plans, we will go ahead with fund-raising this winter and spring.

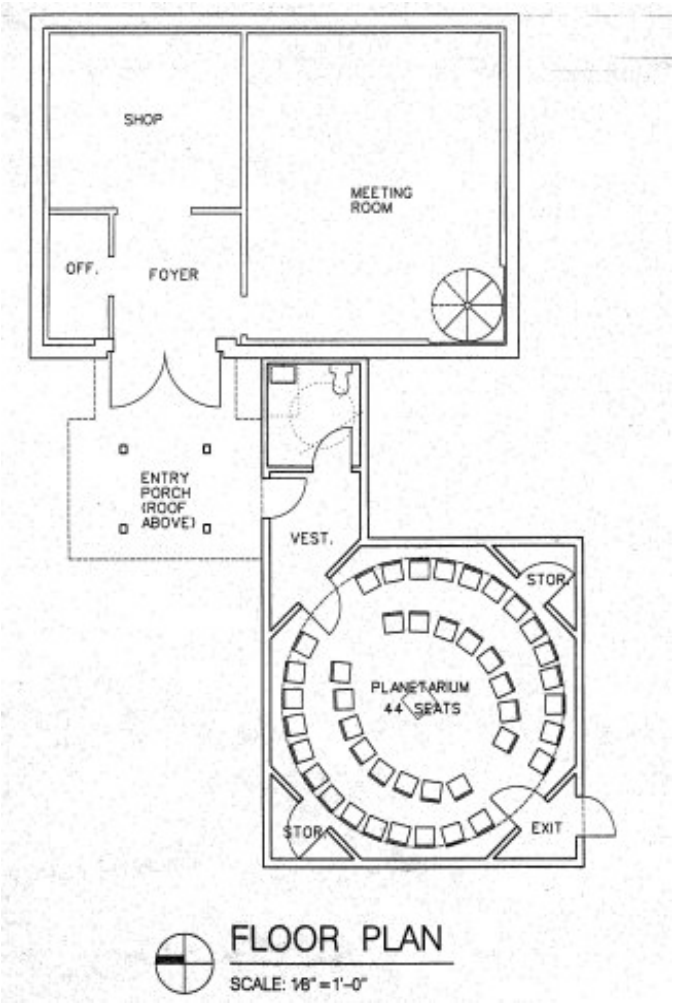
History: From the beginning, John Rudolph, one of BPAA's three founders, planned a planetarium at the Ritchie Observatory. He saw it as an essential teaching tool complementing the telescope and *Starry Night* presentations, making astronomy accessible. Not to mention it being a wonderful fall-back for star parties on cloudy nights, or for daytime astronomy events. In 2001 John formed the first planetarium committee: the group gathered together information covering everything from projectors and domes to audiences and programs. When John was ill with cancer, BPAA members let him know they planned to go forward with the planetarium. You should have seen John's smile! After John's death, I and many of his BPAA friends formed the second Planetarium Committee, building on the first committee's work.

Digitarium Alpha Projector

Projector: We wanted a planetarium projector that could display images of the same quality as computer programs such as *Starry Night*. Standard projectors would not do. The committee considered inventing a fish-eye lens for the Boxlight to give it the capability to project onto to a dome. Then Cathy Koehler showed us a catalog ad for a digital projector newly-released by a small company, Digitalis Education Solutions, Inc. in, of all places, Bremerton. The Digitarium Alpha projector is about one third the cost of the classic planetarium projectors considered by the first committee. The total cost for this projector plus a portable dome would be a little

over $20,000. The projector comes with a planetarium program called *Stellarium.* It weighs forty pounds, is state of the art, adaptable, and portable. Together with the dome it could be taken into schools for planetarium presentations. This projector and a portable dome were shown in a demonstration at the observatory in the autumn. Since that time, Digitalis has improved both the image quality and versatility of the projector. Digitalis also has an extensive set of pre-designed planetarium shows to offer us. The Digitalis partner Karrie Berglund who developed these programs was instrumental in creating the planetarium at the Seattle Science Center.

Dome: John Rudolph had proposed a retractable tent dome for the observatory meeting room. Starting from there, the committee considered several options. The Digitalis portable dome didn't fit in our meeting room, so it wouldn't work for onsite shows. Building a permanent dome in the meeting room seemed unworkable due to the limitations imposed by the shape of the room. Also, sentiment was strong amongst the committee and the BPAA Board, to whom we went for direction, to create a more permanent memorial to John.



Preliminary Planetarium Floorplan 11/5/04

The idea of building a planetarium addition to the present building is very much of interest to both the committee and the board. We have a wonderful volunteer architect in Frank Karreman, John Rudolph's longtime neighbor and friend. He, Matt Rothe, and builder Rick Blumenthal are working on plans now. Two possible plans for an addition are being considered. One is a concrete dome designed by a company called Monolithic. A display hall/entry, a storage room, and a bathroom are part of that plan. The second addition plan is a building that houses a dome suspended from the ceiling, as well as a bathroom and storage rooms.

The Bainbridge Island Parks and Recreation District (BIPRD) would have to give their permission for such an addition. One of their planners was informally approached and his response was positive, especially if the facility could be open more frequently. BIPRD gets many requests from the public to visit the observatory. Perhaps a planetarium display entry could be open to the public during the day.

If the board chooses to build an addition, it would be some time before it would be finished. Consequently, committee members are considering going forward with the planetarium in stages. Purchasing the projector and building a temporary dome in the meeting room, and experimenting with shows would be the first stage. This would allow us to train docents and hone our skills at presenting planetarium programs. It could also stir up public interest in supporting fund-raising for the planetarium addition. We would need a temporary dome in the meeting room. Jim Vaughan and Matt Rothe have been working with this idea. (*See article p.7*)

Potential Audience: One question that concerns the committee is who will use the BPAA planetarium. Will it be used enough to justify the effort required to plan, raise funds, purchase equipment, and build the facility? This question has no certain answer. The Audience Subcommittee, under James Young's leadership, has isolated several potential audiences, the most promising of which is school children.

Faith Chapel of the Bainbridge Island School District has recently revamped the district's science curriculum and expressed interest in using our planetarium, especially for the district's new eighth-grade astronomy program. Jim is also researching the possible need for planetarium shows across the Olympic Peninsula.

Jo Vanderstoop—our own Eric Cederwall's wife and principal at Sakai School on Bainbridge—suggested offering the planetarium program for teachers needing

clock and/or credit hours. Perhaps some of these teachers could take planetarium shows into their own school districts. In this way, our planetarium could reach a broad audience of children.

The BPAA has used the Project ASTRO program in schools on Bainbridge Island, North, Central and South Kitsap County and Fox Island in Pierce County. Project ASTRO is an education program developed by the Astronomical Society of the Pacific (ASP) and used nationally in many schools throughout the United States. The University of Washington's Department of Astronomy is the local training center for Project ASTRO. The program trains an astronomer and a teacher to work as a team to use the program in the teacher's classroom. Unfortunately, many teachers (and astronomers) can not spare the time or commute to Seattle for training. A BPAA Planetarium and exhibit space might be just what teachers requiring clock hours need. But we have no absolute guarantee that these teachers, or even our own BISD, will follow through with expressed interest in the planetarium.

We do have an in-house audience of BPAA members for whom the planetarium could be a teaching/learning tool, and programming adventure. Jim Young and Cathy Koehler are researching other audiences such as people studying celestial navigation and local seniors.

Planetarium Docents: Given the small pool of regular volunteers at BPAA, the committee has been concerned about who would put on planetarium shows. It is exciting to report that over a dozen people have already expressed an interest in volunteering for the training.

Fundraising: Good news! We have about $11,000 in donations for the planetarium already. Sally Metcalf and John Jay, former Kiwanis President, interviewed Ed Kushner about how the $450,000 for the Marge Williams Center (the Marge) was raised. The methods Ed described would apply well to BPAA's fundraising efforts. The steering committee for the Marge waged a telephone campaign to friends asking for donations, and they sold the inscribed pavers that are set in the walkway in front of the center.

What is needed for a BPAA telephoning campaign is a well-connected group of Islanders who aren't shy about asking for donations. Kiwanis members would be wonderful in that role. John Rudolph was a founder of Bainbridge Island Kiwanis and was a well-loved member for forty-five years. They are enthusiastic both because the planetarium was John's dream, and because it fits perfectly into their mandate to help children. They are waiting for the BPAA Board's decision about the planetarium project and for the project budget, and stand ready to assist us in raising funds. In fact, they have already started.

Kiwanis helped produce last winter's concert by the Intensely Vigorous Revolutionary Volunteer Dixieland Band (John's band for thirty-six years) that raised over $3,000 dollars for the planetarium. Also, Kiwanis has committed to the planetarium a percentage of the profits from their breakfasts at the Country Club for every first Sunday of every month through 2005. We are fortunate to have their support.

BPAA's version of the pavers at the Marge Williams Center might be a large mural for the side of the observatory made of inscribed tiles. It could be a mural of the solar system or the galaxy with purchased tiles carrying the names of donors. To add to the above fundraising strategies, Eric Cederwall is researching an extensive list of possible grant sources provided by Digitalis Education Solutions.

Regarding Budget: That is, how much money we have to raise—it will depend on which proposals BPAA Board accepts. A simple traveling show can be purchased and promoted for under $30,000. The estimates for the planetarium addition are not yet complete. The highest number (and our architect thinks it is too high) that has been suggested (by builder Rick Blumenthal) is $250,000. Please keep in mind this is a rough estimate. Frank Karreman thinks he can design an addition for less. And Rick feels that the many builders and suppliers who knew and worked with John might donate labor and materials in his memory.

In Addition: John dreamed of permanent installations for the solar walk, sundials on the observatory exterior, and a solstice gnomon on the pedestal in the memorial garden just south of the observatory. Perhaps our fundraising campaign can cover some of these Rudolph inspirations as well. Talking with Ed Kushner was encouraging: He said to tell the BPAA *"Don't be afraid to dream big. You'd be surprised how easy it will be to raise the kind of money you are talking about—especially for John."*

Proposal Imminent: So the Committee is dreaming big in its proposal to the board this month. Starman John is probably chuckling from somewhere out in the galaxy at the thought that soon, in one form or another, kids will be reaching for the stars in the brand new John H. Rudolph Planetarium.

A Dome Inside the Meeting Room?

Jim Vaughan

Now we have located a projector, we need a projection screen .

A new building will require time: to raise the funds, develop the plans, get the permits and do the construction. During that time we can have a working planetarium by building a temporary projection screen inside the meeting room that can be disassembled when the new building is complete.

As Sally Metcalf points out in her article on page 4, a working planetarium will allow us to develop programs, train operators, and provide a preview for the public. This should increase public awareness of BPAA and help in fundraising. It will also give us insight into what is needed for a successful planetarium building.

The screen must provide a domed projection surface for the Digitalis Planetarium projector. It should be inexpensive and light-weight. We need to be able to remove it when the permanent building is complete. Since it will be big and not easily assembled and disassembled, it must be attractive and not destroy the basic function of the room.

John Rudolph showed a dome in the original model of the observatory. Over the last several years, there have been a number of proposals, ranging from a dome tent that folded into the corner of the room to a 6000 lb. lath and plaster dome requiring posts. My first reaction, when hearing about the latter, was, make it lighter. Perhaps a geodesic sphere covered with acoustic ceiling panels. This brought the weight down to about 850 lbs. I then started thinking about theater sets and called my son, who is in the business. He suggested some theatrical supply companies. I called one and asked about putting a fabric dome inside the geodesic sphere and, with their help, I modified the design to an umbrella-type structure.

Wire Frame Model of a Meeting Room Dome

This dome can be built with aluminum tubing and covered with a cloth designed for theater projection screens. If we use ¾ inch aluminum tubing, the weight will be about 100 lbs. and cost less than $2500. The bottom of the dome would be about 7 feet from the floor and the dome would extend to the ceiling. Since the ceiling is only 14 feet high, the dome must be elliptical—A 16 ½ foot ceiling is required for a spherical dome. There are theater fabrics that are reflective and fire resistant that can be used for the projection screen. The best way to construct the dome may be with gores similar to a parachute. $1,415 is a rough estimate of the cost of a completed cloth dome.

If the dome is designed to have a 7.5 foot wide flat side, the cloth can be extended down to about 4 feet from the floor to form a flat screen for use by a standard projector. The flat surface can be blended into the dome so that a 7.5 foot wide and 5.5 foot high image can be projected. The top of the image may be slightly curved as it blends into the dome. We now project on the wall above the white boards. A white board can be mounted at the side of the screen.

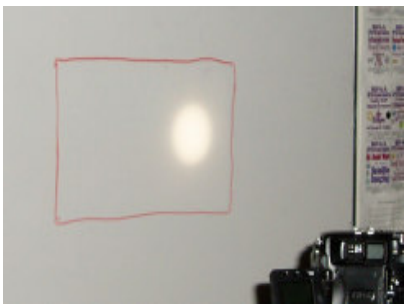
I would turn the meeting room 180 ° and put the projection screen on the South wall: I think that it is best to orient the planetarium with the sky outside so that if we point out where Saturn is during a beginner's session, Saturn is in the same position outside. A second projector can be used to project pictures on the flat screen.

It will take some effort to assemble and disassemble the dome. It's big, space is restricted. I don't expect to be able to go into the meeting room an hour before a show, set the dome up and then take it down afterwards. We can either leave it up as a semi-permanent fixture or set it up for a series of presentations and store it until the next series.

After the dome is installed, we can add cosmetic features such as a curtain to hide the top of the dome and moldings to frame the screen. We must also modify the room lighting and provide an EXIT sign over the door.

After the new building is complete, the dome can be disassembled and the meeting room restored to its original condition.

One interesting side note is that the Rudolph Hole, that lets the Sun shine into the meeting room at the Winter Solstice, will project an image of the Sun on the outside of the South side of the dome. Since the cloth is translucent, it will show up magically every year.



Winter Soltice 2004, Ritchie Observatory. Sun Proceeding Across the White Board.

Planetarium Projector Development

E.M. 'Mac' Gardiner, BPAA President Emeritus

A case can be easily made against the planetarium. A planetarium could be an expensive toy. The BPAA has spent many man-years of effort, trying to decide. No one that I know has ever used a planetarium to solve a problem, clear up a concept or make a discovery. BPAA has used its money to build facilities and tools. To build something that is intended to increase awareness and instruct kids certainly seems trivial...or is it?

A planetarium can create awareness and instruct in a unique manner. Washington State assesses the learning of its children through WASL. Next year, the state adds science to the WASL. But increasingly, it seems difficult to attract kids to science. Inured to pictures and videos, we need a compelling presentation. The planetarium has proved to be such a device. One experience with the planetarium, lasting a few minutes,is likely to be remembered forever, and the factual information that followed will have sunk in as well.

In the trades of size vs number, the small, portable planetarium that can be brought into the school properties seems to win. Simply, you can expose more children, per year, more cost effectively with a portable unit. Fixed installations require very large, or very transient populations, and even the best run out of a fresh audience quickly and become mausoleums.

Portable Dome

Historically, projectors started with few images, usually generated by light from holes in a light shield. The problem with the pin-hole projector is that the image is static and wasteful of light. Most of what is interesting in the sky has motion relative to the fixed star field, and that requires supplementary directed projectors. The images are dim and can only be seen in dark rooms after accommodation.

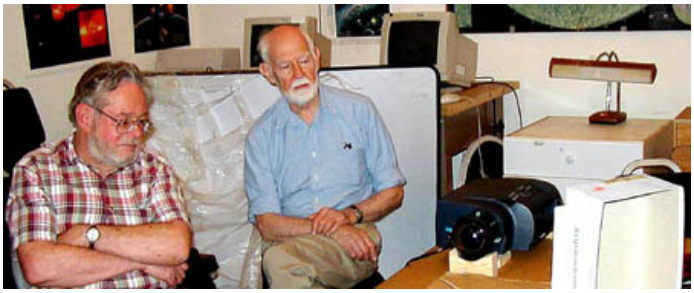
It would seem that the laser projector would be ideal....brilliant compact light source, monochromatic ... any star field is mostly black. Its unbeatable as a pointer. But it can only be directed by mechano-optical means...usually mirrors. Four or five objects is a typical limit, based on eye retentivity, which needs its image refreshed 30-60/sec to avoid flicker. If a raster is generated, then the laser is off most of the time and its advantage is lost. On a 1000x1000 raster, each pixel is illuminated 1/1,000,000 th of the time. Our old friend the CRT screen comes next. It can randomly access several thousand star locations, sit on each long enough to develop bright spots. The problem is that the process is inefficient: to get enough photons per phosphor spot/sec, one talks hundreds of pounds, thousands of watts, and a tricky heat transfer problem at the face of the tube—expensive and not portable.

So we come to the gated light tubes, generating a projected slide. This is typical of computer driven projectors such as Boxlight. The reflective units use micromirrors in, say, a 1000x1000 array with each pixel capable of reflecting projected light to one spot on the screen. This does the job admirably for the portable Planetarium, and only one problem presented itself...there was no hemispherical projector lens available.

One possible solution was to take our old Boxlight computer driven projector and procure a add-on lens that would convert it to a wide Field Of View, hopefully >170º. If not, the next step would be to design and build a lens that would attach directly to the Boxlight, replacing the standard lens. Allan Saunders took the projector home, disassembled it, and determined the optic parameters for the standard lens. Matthew D. Watson, head of Eclipse Optics, designed a new lens, pro bono. The BPAA Board gave approval to have Bob Matthews grind the lenses for it.

Then we discovered a group of lenses developed for cameras (principally, for architectural use). One is a Century Precision fish-eye .3X Barlow with an entrance aperture of 55 mm. It was designed to work with Canon cameras. The first test, with Paul Below's projector at the observatory, showed no image at all. I recalled that the Canon camera called for wide-angle macro-focus position.

So Allan Saunders rebuilt the laboratory projector, with the lens from the Boxlight and the conversion lens. He found that the focus position for the system with the conversion lens was about 3/4" further out than without the conversion. Allan did a super job in dissecting the



Jim Vaughan and Allan Saunders with the Boxlight FOV test set-up at Ritchie Observatory

Boxlight, constructing the conversion assemblies, and rebuilding it with the conversions.With the system in focus, images were shown out to what might be 120-140º with image deterioration showing at the extreme edge. Adding the conversion lens reduces the image intensity from 40 lux to 7 lux along the optical axis.

We were ready to get Bob Matthews to grind the lens, when Diane discovered the Digitarium, built by Digitalis Educational Systems.We determined that the Digitarium exceeded the capability of the modified Boxlight and cost less, and stopped all development.

The Digitarium has several features that make it outstanding:
1. It gives a true (near) hemispherical projection...170° FOV. This gives a panoramic projection, horizon to horizon, at a convenient sill height for a 20' diameter dome.
2. It uses open access software that Paul Middents has reviewed and considers straightforward for further development on our part, or by the manufacturer.
3. It has an ethernet port, making it possible to be used simply as a 170° projector of immersion projection...*Power Point* and *Starry Night* specialists can use their programs on it, probably from a lap-top computer.
4. The system is directed and programmed from a hand held remote...a distinct advantage in a portable planetarium. in which the operator must be mobile.
5. The system contains all the features that we have requested, due to the fact that the programmer is also the president of Digitalis. Future requests are likely to be honored.
6. Its optical performance is about the same as the best analog portable projectors, in terms of lumens, image sharpness, and color. Is capability to zoom in on an area and look at details permits demonstrations beyond those prossible in analog systems.
7. Its cost and weight are far below that of its only competitor, and are less than the analog.

Possible Problems:

1. Viability of the company. It's small, but seems to be well-based. As of June 04, they had sold eight units. I don't think that they will go out of business, but I am quite certain that they will eventually be bought out. Starlab, Goto and Cubex have divided up the portable planetarium business and have a nice niche deal going...and now Digitarium wipes them out. Spitz has the capital and the market, and will probably make Digitarium an offer difficult to refuse. Also Boxlight may offer to buy Digitarium and/or manufacture the projector. We gave them the opportunity to develop such a deal six years ago and they threw us out. Now, the performance is proven, and the niche market is defined.
2. Technical obsolescence.The principal defect of the portable planetariums in service now include low definition, brightness, and light/dark contrast ratio.
Texas Instruments seems to have a stranglehold on the micro mirror chip, and is developing it quickly, primarily for high definition and projection TV. Digitarium can ride on the wave. A new chip, with more and bigger mirrors, is forecast for early next year. More mirrors gives higher definition,and bigger mirrors allow more light and less spillage, improving contrast ratio.

There is an inherent defect in portable planetariums in that human eyes instinctively use parallax. Domes smaller than 60' radius give images that people instinctively know are near—the impact of infinity is lost. Display systems have been made that cause the eye to focus on infinity for objects, but I have seen them only used for single viewers. Until that development takes place, large domes, or the view that nature provides, will have to suffice.

Recommended Action:

1. Purchase the projector at the earliest practical time.
2. Build a portable lightweight dome, whose optical parameters can be changed easily.
3. Refine the specifications for the permanent dome, based on studies made with the two elements above.

Update on the ISSAT: An Email Interview with Terry Mann,

Vice President of the Astronomical League and ISSAT Project Manager

Harry Colvin

As many of you know, the Battle Point Astronomical Association can be credited with giving birth to the International Space Station Amateur Telescope (ISSAT) program. In 1999, Mac Gardiner, one of BPAA's founders and now President Emeritus of BPAA, proposed the idea that a telescope should be placed on the International Space Station for exclusive use by amateur astronomers. His vision became what is now known as the ISSAT program, currently administered by the Astronomical League. The first goal for the program has

been the establishment of a series of robotic telescopes that can be made available for use and operated by League members. The first of these telescopes systems, located at Arizona Sky Village, is currently being tested and soon will give members a remote viewing experience never thought possible just a few years ago.

BPAA and the Bainbridge Island community have supported the ISSAT program in the past with donations and other contributions. The remote viewing opportunities possible under the program should be of special interest to observers in the Pacific Northwest, where the weather essentially prevents viewing for several months during late fall and early winter. I thought, therefore, that it would be of value to get a progress report from the program's Project Manager, Terry Mann. What follows is an email interview (edited and reprinted here with her permission) that tells a story of hard work by a dedicated group of volunteers from around the country who believe in Mac Gardiner's vision of a telescope in space for amateurs.

Arizona Sky Village, home of the ISSAT's first robotic telescope.

Harry Colvin: What is the current organizational structure of the ISSAT and ISSAT committees? Are the committees active and what has been accomplished this past year? Does the program have sufficient volunteers with the essential skills? If not, what steps are planned to recruit volunteers with those essential skills? Is there a fund-raising plan in place?

Terry Mann: The committees that are listed on the website are still standing. Don Parker acts as an advisor when we have questions. A.G. Kasselberg and I have been working pretty steadily in the last couple of months with the telescope. Not all committees have been active. Communications, operations, system analysts, solar station and web masters have been most active. We have had a lot of accomplishment behind the scenes on the website. Much of our software was created by some talented people in Nashville, our system analysts team. This has been a long and painstaking job. The goal was to automate most of our correspondence. They have achieved that. But when you change software, they have to go back and develop the software a little more. We are in that test stage now. We have upgraded most of our software. I think the best accomplishment is the fact we were able to move to a new home, change the hardware on the telescope, develop new software, get used to running a telescope in a different environment. We had to learn how to operate the dome and add our own web cams to check everything as we went. We had some issues with our server we had to straighten out and we did this with a totally volunteer team.

We will soon have three operators. As I said before, sometimes the project doesn't move as fast as you would like but everyone working on this project is very dedicated. We will probably be looking for a few new operators in the next few months and we would like to add an advisory committee. People that are specialists in the problem areas. Richard [Berry] is "the best" at image processing and imaging. We have some current images that we will be working on after the holidays. We will probably recruit from the Web site or face-to-face. Many of us travel to star parties. As a matter of fact, your name has come up for our advisory committee :-) Are you interested? We can talk after the first of the year :-) We have spoken about fund-raising, we have had people say they would help and found they didn't have the time. Bob Gent and I were at NASA Headquarters last year and we plan another meeting for 2005. We will continue to work at fund-raising. In my opinion this is one of the weakest points of the League. We have not had anyone step up who is comfortable writing proposals. We will keep at it!

Harry Colvin: Is the robotic telescope system now in place functioning as expected? If it is not, what are the major problems that need to be solved? How many images have been taken with the system this year? How many nights has the equipment been operational? Are the communication systems; i.e., computers, data links etc. functioning as expected? If not, what are the major problems that need to be solved? What software remains to be developed or purchased?

Terry Mann: The system is functioning as expected. It took a while to get it there. We had a learning curve on the software. I'm sure we will always have some small bugs, I haven't seen a system that doesn't. I don't see any major problems right now. As I said, we are looking at a wireless connection. Anything we do changes operations a bit and we will always be upgrading. This is the nature of the beast. We just need to try to keep the changes to a low roar so we can keep up on the learning

curve. I can't tell you how many images have been taken. I would have to go back to the hard drive and count. We have spent a lot of time testing our software system. We don't run when we have interference from the moon and we have had the normal bad weather. When our software was being developed we ran just enough to test the software. As I said, this was a long process, with volunteers. The equipment has been operational since our own developed software was done. With learning the software, weather and our own software development we have run around 50%. Currently, all of the computers and telescopes are able to talk to each other. We see some needs to upgrade our hardware in Arizona. It is outdated but still working. We will be looking at our computer to see what we need to add to give us the fastest and most reliable connection. We don't need to purchase any software at the moment. We will continue to tweak our own software. Currently, I don't see any major problems.

The ISSAT Alpha Telescope on a 1200GTO Astro-Physics mount at Arizona Sky Village.

Harry Colvin: Telescope Dome: Is the arrangement with ASV working as expected? If not, what are the major problems that need to be addressed? Are communications to the facility adequate? When problems with the dome or equipment occur, is there someone on site at ASV to fix problems?

Terry Mann: ASV has been great! We couldn't ask for better people or a better place. As I mentioned above, we will be looking at speeding up communications, our computer is **so** out-dated! Yes, Gene Turner has been there to help with any issues we have had with the dome or to reboot our computer, if needed. Jack [Newton], Gene [Turner], Bill [Williams], and Alice [Newton] helped us set up. Their support has really helped us along.

Harry Colvin: Publicity: Although the Web site is very attractive, is the site being updated frequently? Is there one person in charge of publicity and is there a PR plan?

Terry Mann: It is pretty obvious our Web site needs work. We have discussed it and will see what we need to do to get the job done. We don't have a publicity person. Originally we were going to use the same PR person as the League's. We really need help with fund-raising and PR. The League needs this help in all areas. If you know of anyone that would be interested in helping with PR or fund-raising PLEASE let me know.

Harry Colvin: What are the goals and timelines for 2005? Considering the delays in the funding and construction of the ISS, has consideration been given to a major redirection of the ISSAT program? What is the budget for 2005?

Terry Mann: Our budget is at $8,000.00. That does include donations from the BPAA and from the Rockford club. The League funded a little over $5,000.00. I'm not sure if any one knows at this point what the status of the ISS is or will be in the future. From the beginning we have all agreed with Richard Berry's philosophy that having the telescope on the ISS would be the crown jewel. I remember when Mac [Gardiner] first came to talk to us. All of us were and still are very excited about this project. Even if the ISS doesn't work out, I believe there is a need for this telescope. Who knows what ideas and options could come to light? We keep searching for all possibilities. We continue to concentrate on the groundwork. This is one of the many reasons we keep going back to NASA. The League is working on finding a balance where we can help each other. Outreach is what they need and outreach is what we do. The ISS-AT is an extension of that and so are our many clubs and talented members. If there is one thing many of us know, it is taking astronomy to the public. The excitement is there and the questions are there. The need for our telescope is also there. Our goal is to run the telescope to its optimum performance for the members and then I would like to see the scope involved in science carried out by amateurs. The League can always use volunteers in many areas, including the ISS-AT. If you know of anyone interested please let me know. We will gladly welcome any help!

I would like to thank the BPAA again for their support. Your generosity is greatly appreciated.

For more information visit the ISSAT Web site at www.ISSAT.org. Although the Web site is well done, it seems that ISSAT needs someone to help keep it current. PR and fund-raising also need attention.

IN THIS ISSUE

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Electronic submissions required.
Attach graphics as separate files.
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