

CONSTELLATION

An Official Publication of the Bucks-Mont Astronomical Association, Inc.

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BMAA News

Summer has come to a close and we are looking forward to another Stella-Della Valley. This year promises to be a freeze-fest as it is at the end of October. Be sure to bring your long underwear and winter-garb. Brrrh!!! Mays Munchables will be providing the food again this year. Bobby and family provide good hot food and coffee in the middle of the night when you really need it. Roger Gordon will be speaking on the planet Mercury. We are pleased to welcome back Dr. Ken Kremer, who will be giving what we anticipate to be a fantastic presentation titled "Launching DAWN to Asteroids; Landing Phoenix on Icy Martian Jackpot: Behind the Scenes at KSC". Of course we have our raffle and pizza party after the talks. We may not have the biggest club, we may not have the darkest skies, but we put on a pretty good show.

Summer Sunspot Courtesy of Herb Borteck



BMAA Gophers

Position	Name
President	Dwight Dulsky
Vice President	Bernie Kosher
Treasurer	Ed Radomski
Secretary	Cathy Ebert
Star Watch Coordinator	George Reagan
Constellation Editors	Chris Sommers and Scott Petersen
Webmaster	Jim Moyer

For More Information About BMAA Go to www.bma2.org.



Join the Bucks-Mont Astronomical Association in its 22nd year of the Stella-Della Valley StarParty in beautiful Bucks County, Pennsylvania. The weekend will be filled with vendors, swap meet, a great pizza party and door prizes raffles, guest lecturers and of course two nights of terrific stargazing. Stella Della Valley has built a reputation as a friendly relaxed StarParty where astronomical friends gather from all over south eastern PA, NJ, DE and NY.

More information and registration forms available on our website
<http://www.bma2.org/Sdv.html>

The VIRTUAL OBSERVER

➤ by Roger Blake

This is a summary of a two-part article published in the September and October issues ASTRONOMY TECHNOLOGY TODAY. It presents new research into the science of visual observations, how humans “see” dim deep space objects with a telescope, and how to optimize the quality of these observations. The objective is to provide definitive and quantitative, answers to the most fundamental questions about telescopes and visual observing: “What can I see?”, “How well can I see it?”, and “What equipment do I need?”

To accomplish this, I developed a computer model to use as a research tool. I call it the “Virtual Observer”. For brevity I’ll refer to it below simply as VO. It is a simulator of visual observations in much the same way that the Microsoft Flight Simulator (MFS) software simulates the piloting of an aircraft. One uses the MFS to learn the fundamentals of flying, and the VO to learn fundamentals of observing. The huge advantage of VO is that it permits me to study, in a controlled manner, the effects of variations of key parameters on what the observer “sees”. This degree of control is simply not possible by the direct experience of observing in the field.

The VO computer model has four components. The target component describes size, brightness and contrast a given deep space object (DSO). The atmospheric component calculates the effects of the air and light pollution. The hardware component models how the telescope and eyepiece manipulate the light to form an image on the retina of the observers eye, and finally, a human component quantifies how well the mind will “see” that image.

The real heart of Virtual Observer lies in its human model component, which is based on the results of the definitive research work performed by John Blackwell, entitled “**Contrast Thresholds of the Human Eye**”, published in the “Journal of the Optical Society of America”, Volume 36, Number 11, November 1946. These results remain the basis for much of today’s low light optical design work in many fields.

The Blackwell research was conducted under a grant from the U.S. Office of Scientific Research as part of the war effort. It was conducted over several months, in a specially constructed building, with carefully controlled lighting conditions. The experimental procedure was to project dim images on screen in a dark room. About two-dozen human subjects reported electronically if they were able to detect the presence of the image. In all, over 2 million responses were collected from the observers, over a range of image sizes and illumination intensities. The measured data from these experiments were analyzed statistically and presented in Blackwell’s paper in the form of charts and tabulations

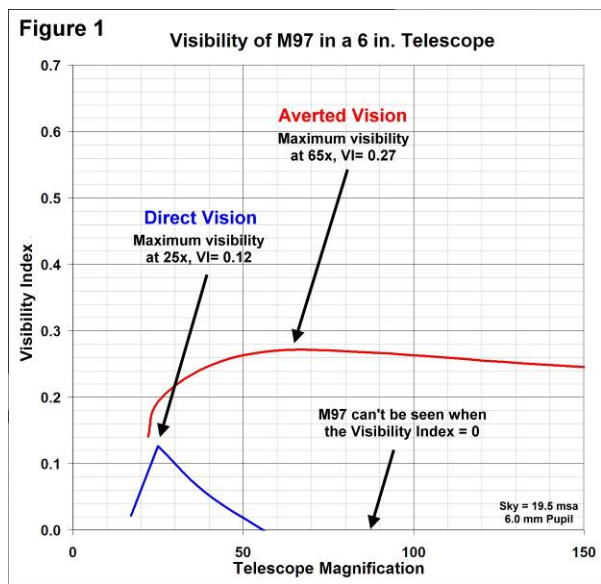
At this phase of development, VO quantifies visibility in terms of a number called the “Visibility Index (VI)”. The index values range from 0 to 1 (approximately). Values near 0 mean that the mind will not “see” the object. Values near 1 mean that the mental image will appear photo-like.

The following two examples of a VO application demonstrate how VO works. First let me pose the simple question: How well can one see M97, the Owl Nebula, in a 6-inch telescope? For the purpose of this example, I chose a light pollution level of 19.5 magnitudes per square arc-second (mpsas), and typical values for the rest. A 19.5 light pollution level corresponds to suburban/rural transition regions, and is a relatively dark sky, but not the darkest by far. VO provides specific answers, for a specific set of conditions, so I ran several different cases, keeping everything constant except the eyepiece focal length, which was varied to change the magnification. The results are shown in Figure 1 below.



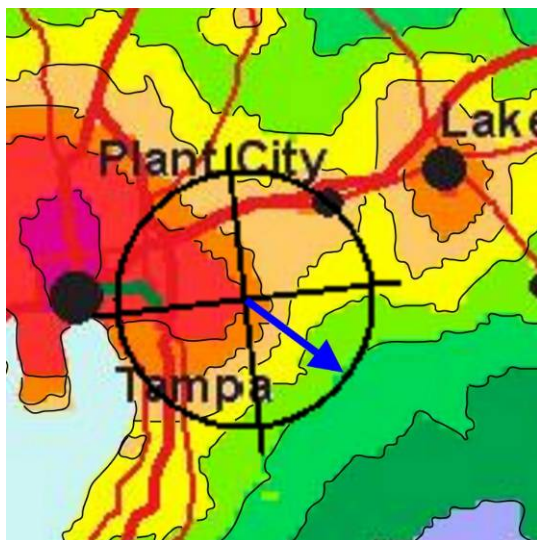
So what is VO telling us in Figure 1? The first thing to notice is that VO provides separate answers for direct vision (blue) and averted vision (red). Direct vision is when you look directly at the target object. This places the image in the center of the retina, which is largely populated with cone receptors. Averted vision is when you look away from the target by about 10 degrees. This places the image in the peripheral region around the center of the retina, which is primarily populated by rod receptors. Rods are very sensitive in dim light, but can't see color, and provide poor resolution. Cones are less sensitive, but see color and provide high resolution.

The results in Figure 1 tell us that the best magnification for this target, with this telescope, with this light pollution, is 25x for direct and 65x for averted vision. And they confirm the fact that averted vision is more sensitive than direct vision because it has a higher maximum value of the Visibility Index (VI).



But Figure 1 also tells us more. Look at the sharp break in the direct vision (blue) curve. These are called cusps. The existence of the cusps was initially a total surprise to me. They mean that there is only a single magnification that will result in optimum visibility, and that visibility will decrease very rapidly with anything higher or lower! It turns out that the cusps are a common feature in the direct vision performance curves. I've been in this hobby for 30 years, and this was big news to me! This is the power of a computer simulator like VO. It can take you places you haven't been.

In the second example, we investigate the effects of light pollution, by comparing the visibility of M97 from 2 sites, 10 miles apart. The map shown is a magnified portion of a screen shot from the new, high resolution light pollution maps contained in the "DARK SKY ATLAS". The reader can view the original map by downloading a free demo version of the DSA from www.taurus-tech.com/dsa_demo.htm.



The cross hairs are centered on a location just outside Tampa Bay Florida, along the border of the red and orange colored regions. This border corresponds to a 19.5 mpsas light pollution level, the same value assumed in the analysis for Figure 1. The circle around the cross hairs has a radius of 10 miles. The blue arrow extends from the center, to a second observing site, located at the edge of the circle. It traverses 4 different color bands, to the new site, located along the border between the lime green and medium green color bands. This corresponds to a darker sky location with a light pollution level of 20.5 mpsas. Although this is a darker site, it by no means the darkest site in the area.

Figure 1 above represents observations with a 6 in. telescope at the center of the cross hairs. VO analysis tells us that if the observer moves 10 miles from the center, along the blue arrow, the visibility of M97 will increase dramatically. Averted vision will increase from VI=0.27 in Figure 1, to V=0.49. This is an 81% improvement! Direct vision will improve from VI= 0.12 in Figure 1, to V=0.30, a 250% improvement! This is actually a fairly typical result for 99% of the population. Light pollution is one of the strongest effects on visibility, and local variations are usually such that dramatic improvements can be achieved over small distances.

At this point, we only have a rough correlation between the visibility index, VI, and the actual visual impression one would have at the eyepiece. In an attempt to improve this correlation, and also to validate the VO model, I have put out a call for help to other amateurs to make controlled observations of specific targets, and report descriptions of their visual impressions back to me. I will simulate each observation condition with VO, and compare the VI to the observation descriptions. I need observations from all size telescopes.

I have posted a "Data Pack" containing a list of selected targets, data sheets, and some comparison images, on my website, <http://www.taurus-tech.com/>. If you are interested in volunteering, visit the site, download the Data Pack, and follow the directions. If you have questions, email me at rablake@erols.com. All participants will be acknowledged in some fashion.

To date, 10 September-October star parties have agreed to advance this request to their attendees. Data Packs will be available at these events.

Astronomy at Arcadia University

➤ By Julia Plummer, Ph.D.

Assistant Professor and Coordinator of Science Education

Arcadia is a private, comprehensive University located in the Philadelphia suburb of Glenside. We have over 3,700 undergraduates and graduate students. Our mission is to prepare students for their future by improving their understanding of global connections and providing them with educational experiences that help them make connections across diverse disciplinary areas.

My job at Arcadia, as a professor in the Education Department, is to coordinate the Science Education program. But with my background in astronomy (M.S.: Astronomy and Ph.D.: Astronomy & Education from University of Michigan) I have the opportunity to both infuse astronomy into my education courses for future teachers and to develop new courses which give students a range of opportunities to explore astronomy. I also continue to pursue research on astronomy education, focusing on improving astronomy curriculum for elementary children and elementary teachers' opportunities to improve their understanding.

In 1988, Arcadia professor Dr. Stephen Huber built a dome and installed a 14" reflecting telescope on the roof of Boyer Hall. This telescope and additional portable Celestrons have been used to enhance the Introductory Astronomy course. Prior to my arrival on campus, this had been the only astronomy course offered (Dr. Huber is also responsible for the physics courses offered by the department of Chemistry and Physics).

I have added a number of new courses to give our students additional opportunities to experience astronomy. *Astrobiology: Life in the Universe* was developed for the Honors Program; students from a broad range of majors explore topics from the origin of life on earth to extra solar planets. *The Night Skies of Pennsylvania*, a seminar for first year students, gives new college students the opportunity to learn what it means to be an amateur astronomer through field trips (e.g. Franklin Institute Observing Night), guest speakers (Dwight Dulsky spoke to our class about amateur astronomers), and planning and implementing their own public observing night using Arcadia's telescopes. *Summer Astronomy Institute for Teachers*, co-taught with Kim Small, Upper Dublin School District Planetarium Director in 2007, brought a variety of astronomy topics and activities to elementary and secondary teachers. I have also infused astronomy into my science methods courses for future elementary teachers through scientific investigations of celestial motion and of the craters on the moon.

Figure 1 (right): Julia Plummer interviewing a third grade student for a research project on celestial motion. The interior of the dome represents the sky. The student is demonstrating the path of the sun across the sky using a flashlight.



My research has focused primarily on general elementary concepts of astronomy such as the apparent motion of the sun, moon and stars. I collect most of my data through interviews of elementary students, middle school students, and pre-service elementary teachers. I use a miniature dome, like a small planetarium dome, to represent the sky while the child uses a flashlight to be the sun or moon or a star and demonstrates their understanding of how the object appears to move across the sky. I also use small models of the sun, moon, and earth to examine how they explain these motions. My research has shown that while there is improvement in understanding of the sun's apparent motion through adulthood, many people will not improve their understanding of the moon or stars' apparent motion beyond the non-scientific ideas held in elementary school. My continuing research explores how children and adults learn to explain the patterns of motion of the sun, moon and stars, through classroom and planetarium-based instruction, educative curriculum, and professional development for teachers.

Arcadia is an exciting place to work; I have many opportunities to design new courses about astronomy (for example, I am currently designing a new course on archaeoastronomy of the American Southwest), work with new people both within and outside of Arcadia, and pursue a broad range of important research questions. I look forward to continuing to make new connections around the region.

BMAA at Arcadia University September 16th 2008



Dr. Julia Plummer invited BMAA to come and talk to her Astronomy class on the role of Astronomical Societies in the community. Dwight Dulsky made the presentation on behalf of the club showing what BMAA does in Bucks and Montgomery counties. The second half of Dwight's presentation described the role and contributions of amateur astronomers to the larger scientific community. There are many opportunities for amateur astronomers to contribute and verify observational data for a variety of research projects. Even in these days of automatic sky surveys, amateurs can play a vital role assisting the professionals.

BMAA is returning to Arcadia in late November to talk to the students about astrophotography. Dwight welcomes any members to come along and co-present during the evening.



A Primer in Astrophotography

➤ By Dwight Dulsky, BMAA

For almost a third of our monthly meetings in 2008, we have devoted towards getting started in digital astrophotography. Several members have done film type astrophotography in the past, but not many have dabbled with the newer digital cameras. Doing amateur astrophotography has never been easier. The phrase “low threshold / high ceiling” certainly applies here. You can get into simple astrophotography for less than \$100 or even use equipment you might already have. Higher end cameras will set you back more (and more!).

Do some research and thought before purchasing equipment. What kind of imaging equipment is best for your optical system? Buying a \$7000 camera to mount on a \$500 telescope and mount doesn't make much sense. The reverse is certainly true as well. However, there are imaging cameras available for all price points of telescopes. You also need to have realistic expectations regarding your results. We'll always be comparing our efforts against what we see in the magazines (and Hubble). Much of the astrophotography you see in the national magazines is the result from very high quality optical systems with very long exposures. Also, a lot of the great results you get from digital astrophotography takes place in “teasing” the image out of the digital file.

Many of the same basic techniques are pretty similar to the 35mm film days. However in that era, the learning curve was dominated by a lot of trial and error, trips to the FotoMat and trying it all over again. Today a lot of that trial and error can be rectified on the fly - or at worse, you just don't waste a lot of time and money on processing and printing only to find out that your whole roll of film has annoying star trails. With today's digital equipment you can do some preliminary image assessment right at the telescope, make your adjustments and continue imaging, hopefully with better results. The thing to keep in mind is that we are trying to collect a few precious photons to create a beautiful image. Let's review some of the basic types of digital astrophotography.

Type of Imager	Purpose	Strengths	Weaknesses
Point and Shoot or Digital Snap Shot Camera	Dawn and dusk scenics / Constellations / Auroras / Lunar / Use on tripod or hold up to an eyepiece.	Inexpensive / lightweight / compact / Can be use for daytime photography	15 sec or less exposure times / may have trouble focusing in low light / might not have a thread for tripod use / no manual focus
Webcam	Provides streaming video for excellent Lunar and Planetary imaging / Webcams Can also be used as autoguiders	Inexpensive / lightweight / can be modified by user / Provides high signal to noise data for Astro imaging	Primarily limited to bright solar system objects / Small sensor and image size / Requires a laptop or computer near telescope and software
Digital Single Lens Reflex (DSLR) Cameras	Good general all around camera for Astro imaging / Very adaptable to both planetary and deep sky use / \$700 - \$2000 price range	Highly adjustable imaging parameters set by the user / Can be used with tripod, piggybacked, prime focus or A focally / Capable of very short to very long exposures / Many special purpose lenses and adapters available / 12 bit tonal image / Takes excellent daytime pictures, too.	Thermal noise may be a problem with long exposures / Focusing can be a problem in low light / images usually require some processing with computer and software / Commercial DSLR cameras have an "infrared cut filter" which is a drawback when imaging the color red in some astro photos (<i>however, this can be removed by a camera technician</i>). Requires a few accessories (T-ring mount, tube adapter and cable release)
High End CCD Cameras	Excels at faint deep sky objects. High end CCD cameras are expensive \$700 – 10K+	Provides a 16 bit tonal image / Provides very long, low noise exposures on large image sensors. Some units have external cooling options.	Will require a sizable investment in a high quality optical system, equatorial mount / post processing hardware and software required

The Learning Curve

I really define astrophotography as a learned "craft". To get satisfying digital astro images will take some time, practice and discipline. It will take you a while to master your tools of the trade. With the exception of the simple point and shoot cameras, most of the other types of imagers have a variety of settings to understand to get the most of your equipment. On top of this, add the fact that you'll probably be doing these adjustments in total darkness. In addition to you managing your imaging equipment, you will also need to make sure your scope and mount are tracking well. Long exposures (over 15 sec) and high magnification demand absolutely dead on tracking to avoid star trails.



Once you have the “hardware” under control, realize that post image processing is a whole other world to contend with. Many image files look downright pitiful when you initially see them on your computer screen. But skillful image processing can separate and accentuate the good image from the noise. This may be where the “art” of digital imaging comes into play. Tweaking digital images can be a lengthy and somewhat complicated business, especially to someone not familiar with image manipulation. Adobe Photoshop and similar programs have a myriad of options, most with very unfamiliar names and consequences. Getting the most from your astrophotos will require that you really become familiar with your image editing program(s). Fortunately, there is some common ground between programs. But, in general the “language” of image editing is new territory for most folks. On the plus side, you will be able to do things to your images that you never even imagined were possible. Remember, save and archive your original images. Save everything incrementally as you go along to different file names. Most of what you do to an image can be reversible, so don’t be afraid to experiment.



Image: The Double Cluster. Canon Digital Rebel XTi, 5 X 15 sec exposures, ISO 1600, Prime Focus, 5 Images Stacked and Optimized in RegiStax (Courtesy of Dwight Dulsky).

There are many tips and tricks for whatever aspect of astronomical imaging you might try. You will learn a lot from your mistakes. I always have a big list of things to remember to bring – next time (extra counterweight to balance the camera, extra batteries, a chair, bug spray!). There is a lot of literature on the subject both online and in print or on CD. Just Google something like “CCD Astrophotography” “Astrophotography with Webcams” “DSLR Astrophotography” “Astrophotography How To”, you’ll get plenty of hits. Amateur astronomy in general has been very rewarding to me over the years as there seems to be no end to celestial sights and challenges. Astrophotography is just one more layer on this cake to keep you challenged and looking for more.

Quarterly Meeting Minutes

**Bucks-Mont Astronomical Association
September Executive Committee Meeting at
Churchville Nature Center
September 17th at 7:30 PM**

Present: Dwight Dulsky, President; Ed Radomski, Treasurer; Frank Shubert; George Reagan,,StarWatch Herb Borteck, Secretary ; Art Baldwin, Bernie Kosher, Cathy Ebert, Secy Pro Tem.

The Meeting was called to order at 7:30 p.m. Ed Radomski gave the Treasurer's Report.

Stella Della Valley: Ed Radomski to apply for insurance and sign contract w/ Sue Gould at Onas. Seems increase is 10% each year. George Reagan to send out press releases and keep list of volunteers jobs during, weekend. Astronomical League Doorprizes discussed. Setup volunteers contributions for items (firewood, name tags, lists, update. Website info, speaker lists, Email previous attendees and those currently. Registered, setup picnic tables, snacks). Sue Gould will deliver letters to Onas' neighbors regarding cooperation Regarding outside lights. Dwight will go to Onas week prior to check new lights in bath house area. Early registration ends one month before event, Oct. 10, 2008. Ed Radomski received phone call from a freshman at Hiram College in Ohio, starting an Astronomy club and wants to bring around 15 students to SDV. He's in process of submitted budget. Considering the two rooms on third floor of Texas Building, awaiting confirmation before assigning rooms. According to Sue Gould, there are a total of 39 beds available. In past years, we averaged around 16 in dormitories. If additional rooms needed, Sue will accommodate. NJ StarQuest in Hope running same weekend as SDV at Christian Center. Intro to Astronomy discussion tabled to Oct. public meeting at PVNC. Meeting adjourned 8:45 p.m.

Respectfully submitted,
Catherine Ebert, Acting Secretary.

BMAA 2008 StarWatch Schedule (see www.bma2.org for updates and maps)

October	1 Wed	8pm	BMAA General Meeting, Peace Valley Nature Center, Doylestown
	2 Thu	7:30pm	StarWatch, Honey Hollow Environmental Education Center, Solebury
	7 Tue	7:30pm	StarWatch, Covered Bridge Park, New Britain (Adjacent to the Covered Bridge)
	21 Tue	7:30pm	StarWatch, Lower Nike Park, Warrington
	24-26 Fri-Sun		STELLA-DELLA-VALLEY XXII, Camp Onas, Ottsville
November	3 Mon	7:30pm	StarWatch, Cedar Hill Park, Horsham (Cedar Hill Rd. near Horsham Rd.)
	5 Wed	8pm	BMAA General Meeting, Peace Valley Nature Center, Doylestown
	7 Fri	7:30pm	StarWatch, Silver Lake Park, Bristol
	19 Wed	8pm	Special: BMAA Open House , Peace Valley Nature Center,
	25 Tue	7:30pm	StarWatch, Gwynedd Wildlife Preserve, Upper Gwynedd
December	3 Wed	8pm	BMAA Holiday Meeting, Peace Valley Nature Center, Doylestown

All StarWatches are free and open to the public. StarParties are open to members and guests only.

Call the BMAA Message Line 215-579-9973 for activity updates. (Cancellations due to weather will be announced 1 hour before the event.)

Constellation-Instructions to Authors

You need to be a BMAA member to submit an article. Articles are typically ½ to 2 pages in length. They can vary in topic from reviews of books, star parties, observing, equipment, issues of general astronomical interest, etc. Go to the BMAA website and take a look at *CONSTELLATION* back issues and you will get the idea. Another good example for articles is on the Cloudy Nights web site (<http://www.cloudynights.com>).

As to the format for articles, please adhere to the following:

Word Processor: MS Word.

Font: Times New Roman

Margins: 1 inch all sides.

Title Font Size: 14 pt

Text Font Size: 10 pt

Spacing: Single Space

Original Figures: Gray scale or color, jpeg format, and please save the file as the size as it would appear in the article (about 2" x 3"). The figures should be original due to copyright issues.

The Editors will modify the article as needed to fit the format.

Email articles to: constellation@bma2.org

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Bucks-Mont Astronomical Association Membership Application

Name and address _____

Renewal() New Member()

Renewal Dues are \$25.00/year and are due starting in November

Dues for new members are:

Telephone _____

January	\$25.00
February	\$23.00
March	\$21.00
April	\$19.00
May	\$17.00
June	\$15.00
July	\$13.00
August	\$11.00
September	\$9.00
October	\$25.00
November	\$25.00
December	\$25.00

Home _____

Cell _____

E-mail _____

Additional members from the same household are 1/2 price.

Your name, city of residence, telephone number and e-mail will be posted in the member's area of the website that can be viewed by using a club issued name and code word. The code is changed periodically and issued to club members only.

() Do not list my name or any personal information on the website.

The Association saves considerable money each year through electronic delivery of the Constellation. Printed copies will always be available at the meetings. You will receive the Constellation by being notified by E-mail when it is available on the website.

() Check here to receive the Constellation by Traditional mail.

Your e-mail address will be added to the e-group list and you will receive one e-mail a day containing all the mail that is sent to the group address by other members that day. This will allow you to be aware of current activities and discussions, and you may respond to any message by addressing your response to the e-group address. You must be a member to send to or receive messages from the e-group. You may cancel or change this option by contacting Jim Moyer, info@bma2.org.

BMAA Web site - <http://www.bma2.org>

Please return this form, with a check payable to BMAA, to:

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Chalfont, PA 18914