CONSTELLATION

The Official Publication of the Bucks-Mont Astronomical Association, Inc

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President's View

Stella-Della-Valley XVII

SDV planning is progressing well this year. Bob Black has done a great job of organizing and motivating the teams. Over 70 door prize solicitations were sent out to vendors (thanks, Jeannie), and we've already received some prizes including two, yes two, telescopes! The biggest hurdle so far centered around the contract with Camp Onas. Bob was able to minimize the cost increase through some hard negotiation. With respect to food, the SDV committee is pursuing May's Munchables to cater SDV this year. May's specializes in star parties and has been well received at recent events. The SDV committee expects to save money this year on copying and mailing costs, and the publicity guys stand poised to reach out and reel in waves of attendees. We have no competition with other star parties this year, so things are looking good. SDV should again be a success, and let's ALL plan now on attending. Mark your calendars for the weekend of October 24-26. Oh, and there will be one other attraction this year. Read on . . .

And In Other News . . .

BMAA has acquired a 14" Newtonian telescope! It was exactly one year ago that member Bernie Kosher brought to our attention that the Willingboro Astronomical Society was selling their telescope. By the end of last year we had agreed to terms of sale. The attempts (all foiled by bad weather) at a joint star party were aimed at introducing us to the scope. The party didn't happen, but the time came in August to execute the transfer. Ed Radomski, Steve Bryant, Bernie Kosher and myself met the WAS folks at their observatory last month and brought the scope back.

This is a big step forward in the development of our observatory. Our efforts with Bucks County Parks are expected to bear fruit later this year. With a scope and a site, we will only be a little cash and a little elbow grease away from an actual observatory. Cool!

In the meantime, the plan is to build a transportable mount for the telescope and show it off at SDV. Anyone wishing to be involved in this project is encouraged to contact me. The effort required to make a base for the mount should be relatively modest, but we could choose to dive in, make some upgrades, and perhaps give the thing a coat of paint. We need a brainstorming session soon.

I hope some of you out there are as excited about this as I am!

Clear Skies...

Antoine Pharamond
President, BMAA

'NASA Space Place' column inside

Wednesday, September 3 at 8:00p - BMAA General Meeting at Peace Valley

Wednesday, September 17 at 8:00p - BMAA Business Meeting at Peace Valley

The next BMAA General Meeting is scheduled for Wednesday, October 1 at 8:00p

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Bucks-Mont Astronomical Association, Inc

2003 Calendar of Events

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Careful Planning and Quick Improvision Succeed in Space Biz

- by Tony Phillips

On December 18, 2001, ground controllers at JPL commanded NASA's Deep Space 1 (DS1) spacecraft to go to sleep. "It was a bittersweet moment," recalls Marc Rayman, the DS1 project manager. Everyone was exhausted, including Deep Space 1, which for three years had taken Rayman and his team on the ride of their lives.

DS1 blasted off atop a Delta rocket in 1998. Most spacecraft are built from tried-and-true technology-otherwise mission controllers won't let them off the ground. But Deep Space 1 was different. Its mission was to test 12 advanced technologies. Among them: an experimental ion engine, a solar array that focused sunlight for extra power, and an autopilot with artificial intelligence. "There was a good chance DS1 wouldn't work at all; there were so many untried systems," recalls Rayman.

Nevertheless, all 12 technologies worked; the mission was a big success.

Indeed, DS1 worked so well that in 1999 NASA approved an extended mission, which Rayman and colleagues had dreamed up long before DS1 left Earth-a visit to a comet. "We were thrilled," says Rayman.

And that's when disaster struck. DS1's orientation system failed. The spacecraft couldn't navigate!

What do you do when a spacecraft breaks and it is 200 million miles away? "Improvise," says Rayman.

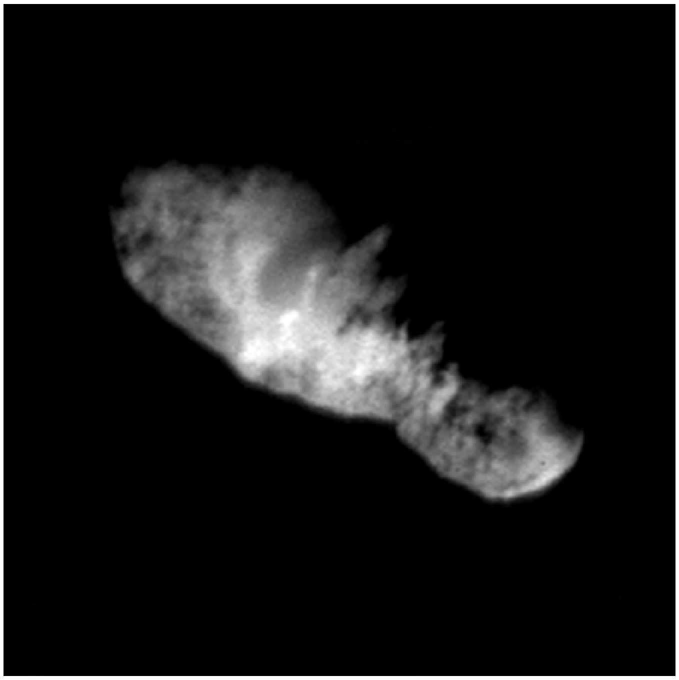
Ironically, the device that broke, the 'Star Tracker,' was old technology. The DS1 team decided to use one of the 12 experimental devices-a miniature camera called MICAS-as a substitute. With Comet Borrelly receding fast, they reprogrammed the spacecraft and taught it to use MICAS for navigation, finishing barely in time to catch the comet. "It was a very close shave."

In September 2001, DS1 swooped past the furiously evaporating nucleus of Comet Borrelly. "We thought the spacecraft might be pulverized," Rayman recalls, but once again DS1 defied the odds. It captured the best-ever view of a comet's heart and emerged intact.

By that time, DS1 had been operating three times longer than planned, and it had nearly exhausted its supply of thruster-gas used to keep solar arrays pointed toward the Sun. Controllers had no choice but to deactivate the spacecraft, which remains in orbit between Earth and Mars.

Rayman has moved on to a new project-Dawn, an ion-propelled spacecraft that will visit two enormous asteroids, Ceres and Vesta, in 2010 and 2014. "Dawn is based on technologies that DS1 pioneered," he says.

Even asleep, DS1 continues to amaze.



This was the final image of the nucleus of comet Borrelly, taken just 160 seconds before Deep Space 1's closest approach to it. This image shows the 8-km (5-mile) long nucleus from about 3417 kilometers (over 2,000 miles) away.

Find out more about DS1 at ***http://nmp.jpl.nasa.gov/ds1*****.**
For kids, go to ***http://spaceplace.nasa.gov/ds1dots.htm*** to do an interactive dot-to-dot drawing of Deep Space 1.

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

Observing Tips

Mars

- by Bernie Kosher

By the time this article shows up, Mars will have passed opposition and will be moving further from the Earth and becoming a smaller target. However, for the next few weeks it will still be plenty large enough to show detail to the visual observer and CCD enthusiast.

What did we see as visual observers, and why did some see more than others?

Three factors enter the picture; atmosphere, telescope and observer. Included in 'atmosphere' is the altitude of the planet from our latitude on Earth. Under 'telescope' are all the accessory eyepieces, and includes the type of scope. "Observer' covers the skill, physical condition of the eye and the limitations of vision.

The most important factor is the observer. Even a small scope. if of any reasonable quality, should reveal considerable detail of the planet. After all, a magnification of about 75 made the disk of Mars look the size of our moon seen naked eye.

The eye of the observer is simply a receptor, much like a camera. the image formed is processed in the brain. With a normal eye, an observer with much time at the eyepiece will 'see' more than one who takes only quick, casual glances and wonders why all this detail drawn by observer A is invisible to them. Consider the factors involved.

The human eye is accustomed to seeing high contrast, bright objects in daylight. The planets through a scope are plenty bright, but the detail is very low contrast. One must observe long and often to get the most out of the view. The mind will become accustomed to the low contrast detail swamped by the bright planet.

I wish I could recall where I read the following. In a series of experiments, a letter 'E' was printed in large, black type on white paper. The room was fully darkened and the person being tested was left in the dark until the eye was dark adapted. A flash illuminated the drawing momentarily. The subjects all stated they saw only a bright shot of the paper, with nothing appearing on it. But after several seconds a mental afterimage appeared and the letter 'E' was visible in the afterimage. I am sure this fantastic adaptation of the eye/brain system to unusual lighting relates to the visibility of planetary detail.

In another example, visitors to a large observatory refractor were told to look at Mars for several minutes as to allow the eye to become accustomed to the glare of the planet.

I find I actually see more detail (on the planet) while making a drawing if I illuminate the sketchpad with a fairly bright light. My eyes remain adapted to a brighter light and are not overwhelmed by the planets glare.

The brain wants to see detail, and if stressed will add detail where none exists. This is generally accepted as the reason for the 'canal' furor of the early years of this century, which extended into the recent years until the 'canals' were proven nonexistent by the space probes. Many fine observers were deceived into believing in the canals, including the famous observer Percival Lowell. By the way, the term 'canals' is a mistranslation of the Italian 'canali' which means 'channels' and was never intended to denote canals as water courses. Many and fabulous were the creations of men who claimed the canals denoted an intelligent life on the planet Mars. And it was all a result of deception.

The mind attempts to find geometric shapes where none exist, and will attempt to 'connect the dots' of isolated dark spots on a bright background. This is the basis of optical illusions, where a dark area appears to exist between dark intersections on a light background.

Avoid staring intently at any one area of the disk for more than a few seconds or the mind will either blank that area or find false detail. Refocus slightly every minute or so to cause the eye to change. Remove the eye from the scope to rest it often. Staring at one spot is very tiring to the eye and will cause a type of fatigue.

A bit more of the physiology of the observer is touched on in the 'telescope' segment.

A decent scope of 3" aperture will show an enormous amount of detail on Mars. Larger scopes will show more if the optics are good, and the air will stand it. Larger scopes make it easier to see the detail due to a combination of greater resolving power, ability to stand more magnification and the physiological aspects of brighter images.

However, larger scopes are affected much more by poor seeing conditions, mirror currents and thermal stability.

Each of the factors will degrade the image, sometimes to the point where the smaller scope outperforms the larger. It has been stated, sometimes by competent and knowledgeable observers, that a scope of about 10" aperture will always outperform the larger ones, rendering it meaningless to purchase those larger apertures. This is nonsense. Physics wins out every time. It is true that the smaller scope will show a steady, contrasty image more often than a larger one. But is quite impossible for the small scope to show what a larger one will during those split seconds of absolutely perfect seeing.

But for us economically challenged amateurs, a scope of about 4" aperture for refractors and about 6" for reflectors will show enough to a serious observer to keep one happy.

A bit of theory........an unobstructed aperture will show more contrast. This is the basis of the 'refractor versus reflector' discussions. Indeed, a fine 4" refractor will show more than a 4" reflector in most cases. However, let's compare apples and oranges. The reflector is most likely a shorter f ratio (shorter focal length) and will cause more of the eyepiece aberrations to intrude. The open tube is

- continued, next page -

conducive to current effects. The main mirror is much more affected by changing temperature. The observer is near the opening of the tube and body heat waves waft across the line of sight. The reflector is usually mounted in such a way that the mirror is very close to the ground and immersed in layers of different temperature air. The optics are usually dirtier than in a sealed refractor (referring to Newtonian types, not the sealed tubes of SC and Maksutov types). The optics are usually held in collimation by devices prone to movement with every shake and bump, and therefore the alignment shifts all over the place. Finally, the dreaded diffraction effects of the secondary mirror and support vanes degrade the contrast.

To its credit the reflector is perfectly achromatic, cheaper and usually shorter and easier to mount and transport.

Theory tells us that the amount of out of focus color in small, doublet refractors is about equal to a quarter wave of error at the focal plane. But observers pretty much universally agree that this does not degrade the image too much. The eye is relatively insensitive to the far red and the little bit of blue is almost unnoticeable.

ED glass in expensive refractors almost eliminates false color inherent in doublets, but who can afford a large scope of this type?

In defense of the reflector, if one has the opportunity to see the planets through a long focus reflector with a small secondary mirror obstructing less than 20 percent the diameter of the main mirror, it's performance must be seen to be appreciated.

Larger aperture makes detail easier to see, partly due to light intensity and partly due to color vision entering the picture. With large scopes the cones on the retina detect color and the brain interprets the image with greater contrast due to that factor.

Eyepieces are critically important. In my own experience, a Televue Plossl 10 mm on my 6" reflector gives far more contrast than a cheaper Plossl from a reputable company. This is a very subjective thing, so try various eyepieces yourself and decide which is best for you. I also find a 2X Barlow with a moderate focal length eyepiece gives somewhat better images than a short focus eyepiece yielding equal power. This is especially true for short focus Newtonians.

Onto the atmosphere.

In his wonderful work 'Celestial Handbook' by Robert Burnham, he mentions a statement by the famous double star observer S W Burnham quoted roughly as follows. One night the companion to Sirius will be visible, while the next night, seemingly the same in every respect, it will be no more visible than if it did not exist. Obviously, there is a difference. The atmosphere is not as stable.

Seeing, as used by astronomers, refers to the steadiness of the air, while transparency is a measure of the faintest star visible. The two seldom go hand in hand. On a clear night, with very faint stars visible, the air is often unsettled and the stars twinkle strongly. This same twinkling will wash out the fine detail on a planet badly. A night with a slight haze will often be steadier than a clear night. Since the turbulence is caused by air masses of different temperatures, and therefore different refractive indexes, it follows that a night where in the temperature is stable will be better than a night that is clearer but with rapidly dropping temperatures. Cloud masses, thermals and other atmospherics are root of the evil. It also follows that the higher the planet is in the sky, the more likely it will be to be steady. Looking through a thinner layer of air improves the seeing, and also that lesser thickness of air will contain less total particulate matter to scatter the light.

To see the effect of changing air masses moving past the line of sight, defocus the planet or a bright star and watch for a few minutes. The swirling ripples are what is causing your poor seeing. Put your hand in front of the objective and watch the rising heat waves.

Sometimes one can move just a few feet to avoid the heat waves from local sources. Sometimes a move of several hundred feet will take you out of the path. Other times you need to move to a plateau in the Andes.

While watching the moving air currents, note they seem to have several speeds on various nights and in various conditions. Slow lazy currents are often caused by the scope itself, mostly the main mirror. That mass of glass has a high heat capacity and a low emisivity, so it gives up it's heat slowly and mostly by warming the air near it, causing rising currents. These are the 'tube currents' you hear so much about. Perhaps a fan will help. Try it. Currents rising from the mount, the ground and the body air somewhat preventable. If the scope is exposed to sunlight it will absorb tons of hear, which will be radiated later. During this time the figure of the objective will also be changing. Little change is noticeable in a refractor, but a reflector will be badly influenced.

A refractor or catadioptic type scope is normally mounted well up in air compared to a Newt on a dob mount. The dob is sitting near the different temperature ground and is immersed in it's bad effects. If a low hill is available, try observing from there.

I have no experience with the apodizing mask, but those who have tried it swear by it.

Supposedly the mask limits the effects of turbulence by cutting the light more from the edges of the objective than the center portion, therein improving the image as the greater area of the edge zones have a greater affect than the center.

I also have little experience with color filters, though I have tried them. Personally, I find they make the detail easier to see, but unless they are optically perfect they have a negative impact. They also scatter some light.

In closing, let me add this. There is no medical evidence of the cones of the eye having a different separation from one person to the next. Fine detail, close doubles stars etc. should be about equally visible to all normal eyes under proper conditions and experience. Some eyes are indeed more sensitive to contrast, but I believe a lot of this is experience and dedication.

So go out and look for a while. The amount of Martian detail is amazing.

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- BMAA member Bernie Kosher can be reached at bkhere@optonline.net. *[-ed]*