CONSTELLATION

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President's View

Mars, Mars, Mars!

In case you haven't heard yet, we will not get a closer look at Mars in our lifetimes. So let's make the best of it. Mars reaches opposition every two years (approximately), but apparitions are not all created equal. Due to the significant eccentricity of Mars orbit, its' distance from Earth at opposition varies by a factor of almost two. It follows that its angular size also varies by the same factor, between 15 and 25 seconds of arc. That's like going from 150x to 250x without any image degradation!

The period of this cycle is about 15 years, which means that most astronomers will only get a handful of chances in their lifetimes to see Mars at its biggest and brightest. But wait, there's more. Because we only catch up to Mars every two years, Mars' opposition and perihelion seldom coincide exactly, so not even all perihelic oppositions are created equal. As it turns out, 2003 is the best of the best. Perihelion and opposition occur within two days of each other, at the end of August. The result, Mars will be bigger in our scopes for the entire months of August and September than it ever got two years ago. And it won't get this big again, ever, as far as we're concerned. The next time it will even come close will be in 15 years.

So, like I was saying, let's make the best of it. I would like to propose a little BMAA road trip to Florida at the end of August. Why Florida? There are two reasons. First, Mars won't be very high in the sky here, only about 34 degrees. It will be more like 50 degrees in Florida. And second, the seeing is incredible down there to begin with (especially in the keys).

Clear Skies...

Antoine Pharamond
President, BMAA

'NASA Space Place' column inside on page seven

Wednesday, June 4 at 8:00p - BMAA General Meeting at Peace Valley

Wednesday, June 18 at 8:00p - BMAA Business Meeting at Peace Valley

The next BMAA General Meeting is scheduled for Wednesday, July 2 at 8:00p

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BMAA MESSAGELINE - 215/579-9973

email: ***info@bma2.org***

website: ***www.bma2.org***

Bucks-Mont Astronomical Association, Inc

2003 Calendar of Events

StarWatch Chairman: George Reagan, 215/741-3701 *StarWatch@bma2.org*
Information Line - 215/579-9973

For directions, visit the BMAA website **http://www.bma2.org** or contact George Reagan**.**
Please call the information line at 215/579-9973 before you leave for any event.

The *CONSTELLATION* is the official publication of the Bucks-Mont Astronomical Association, Inc, a 501(c)3 non-profit organization incorporated in the Commonwealth of Pennsylvania and exists for the exchange of ideas, news, information and publicity among the BMAA membership, as well as the amateur astronomy community at large. The views expressed are not necessarily those of BMAA, but of the contributors and are edited to fit within the format and confines of the publication. Unsolicited articles relevant to astronomy are welcomed and may be submitted to the Editor.

Submission deadline for articles is the 15th of the month prior to publication.

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Observering Tips

June 2003

- by Bernie Kosher

Last month's column, on double stars, seems to have been mostly physics, with just a bit of observing.

We talked on what separations can be expected in an instrument of a given size, and on the terms 'binary' and 'optical'. Also a passing mention of disk sizes in various instruments. I have since done a bit more reading on the subject and found an interesting, and contradictory, statement by some authorities regarding the size of the disk seen in a scope.

I stated the size of the apparent, or 'Airy' disk, seen in a scope was 4.56arcseconds/aperture in inches. In some books I have read this to be 11/A. Which is correct, I will pursue and pass on. The first (4.56 arcseconds/A) makes more sense to me, as my 4.5 inch refractor easily shows a pair of stars of 1.4 second separation as two separate disks. If the real size at the focal plane was 11/4.5, which is over two arcseconds, the stars would show as a pair of overlapped disks.

Anyhow, back to Earth.

So why observe double stars? Is this not one of those "if you've seen one you've seen them all" things? Not to me. There are colored doubles, and ones of differing magnitudes. There are doubles lost in a Milky Way star field and others isolated and alone. There are triples and quadruples and fipples. When you come down to it, I observe them because I think they are pretty little things. And, by Jung, I can do them from my lit up backyard, while the deep sky observer sits inside swilling hellish brews while watching reruns of Saturday Night Live. So let not the deep sky observer, lost in his search for the faintest fuzzy, belittle this branch of amateur observing. If you've seen one faint fuzzy, you've seen them all.

Double stars gave professional astronomers their first insights into stellar masses. If one can find the rotational period of a pair of stars, the apparent separation, and knows the distance, one can find the sum of the masses. By the shape of the orbit, usually determined spectroscopically, one can determine the ratio of the masses of one to the other, and thusly their individual masses.

Star colors were mentioned in a prior paragraph. Now an interesting thing about stars is that they show color at all. After all, even the lowest temperature red giant has a color temperature far higher than an incandescent light bulb. Yet the bulb looks white and the star red. What gives? The answer is the relative intensity. At high levels the light from the light bulb looks white to our eyes. The low relative level of the stars light falling on the cones in the eye gives us the colors we see.

Individual perceptions of star colors are notoriously discordant. Check several different lists and you'll find all kinds of differing opinions. Also some far out color names. The term 'olivaciae subrubicunda' appears as a color. As far as I can tell this means greenish red. Hmmm. Such color names as 'fawn' and 'lilac' are common, and others are equally poetic. For the record, fainter stars will almost always look redder than bright ones due to physiological effects. The Purkinjie effect causes red stars to appear to brighten on staring, among other things.

A few of the BMAA members have asked for a list of colored doubles, which I will copy and bring to the July meeting. In the meantime, the web site listed gives a number of them.

Finding doubles from catalogs can be a bit of a sticky wicket. My personal preference is the dreaded star hop and grope. Find a reasonably close naked star and hunt around from there. After all, my enjoyment of the sky is seeing what's there. Perhaps I'll stumble on something else.

For the enthusiast there are setting circles and coordinates from catalogs.

And on to the question "What can I expect to see?"

For the amateur with your standard 4" or larger scope, doubles separated by over about three seconds should be easily split at powers of 100 or less. If the magnitudes are close and the stars are not too bright or faint that is. If the sky is steady and the scope is a good one, doubles at twice the theoretical limit should be fairly easy. As one approaches the 4.5/A limit, the situation gets a bit hairy. If the optics are good, and the sky superbly steady, one can expect to see stars with overlapping disks in moment of superior stability. But this also requires a high enough power for the eye to perceive them as such. The infamous 60 power to the inch of aperture limit may be necessary. However, and this is a big however, I have run my 6" up to 500 power to split a really tough one.

If your scope does not show stars as disks with a cleanly defined ring or two when the seeing is steady do not expect to separate the closest ones. The optics must be good to excellent.

For those who absolutely must get the most out of their scope, try an apodizing screen of some sort. What's an 'apodizing screen' you may ask. The word is derived from the Greek and literally means 'without feet.' For the telescopist it refers to modifying the entrance stop. Okay, the shape of the objective. One goes about this by blocking part of the round shape of the objective.

- continued, next page -

Some examples used by professionals and amateurs; place strips of tape across the mouth of the tube. This changes the diffraction pattern and may allow a close companion to be found between spikes instead of on the diffraction rings. The same result is achieved with wires or strings. Place a large disk, centered on the objective, across the mouth of the scope. This will make the central core of the Airy disk smaller while throwing light into the rings. A very close companion may be made visible. Another ploy is placing a hexagonal aperture over the mouth of the tube. Place your Aunt Sally in the light path. Whatever it takes.

These methods are at the expense of sharpness and all modify the pattern seen at focus. They are tricks specific to the matter at hand.

A type of apodizing screen which some amateurs swear by is made from window screening. Three disks the diameter of the objective are cut. A round hole about 90 percent the diameter of the objective is cut in one, a hole about 70 percent in the second and 50 percent in the third. The exact sizes are available in the literature and I will track them down if anyone is interested. They are stacked with the screen lines at 30-degree angles and stitched together, then placed over the tube opening. The advantages allegedly are; improved stability of the image, less turbulence effect; increased contrast on planets and extended objects and less tube current effects. I assume this is due to the fact that the outer annulus of the objective is dimmed the most, thus the largest percentage of the bad effects of turbulence etc is lessened most.

While I have not tried this, it seems to be an interesting concept. However, there are also color effects caused by this, due to the screening acting the same as a diffraction grating and splitting the light into colors.

I also assume the sizes of openings should be different in a refractor, as there is no central obstruction from a secondary.

Again I am wandering.

Some of the very close and nearby doubles will show orbital motion in just a few years, although keeping track of such objects is a bit out of my personal interest.

One encounters the terms 'companion' for the smaller star, along with 'comes', though this term is also used for faint field stars. The plural of comes is 'comites.' These terms don't seem to follow a rule as to whether they refer to physically connected pairs or chance alignments.

Drawings of the apparent orbit of doubles are drawn with the brighter star fixed and the companion circling it (actually, the orbits are all ellipses). In reality both stars are orbiting the common center of gravity. The larger part of the ellipse is the 'major axis' and the shorter the 'minor'. The 'nodes' are the points where the orbital planes coincide.

Doubles are listed with several characteristics, which to the amateur observer are somewhat beside the point. For us, the magnitudes of the components, the separation in seconds of arc and the apparent colors are enough.

For the serious observer who records such thing, there is also the 'position angle' which is a measure of the position of the faint star in regards the brighter. The angle is measured from North as zero through east as ninety degrees, with south as 180 and due west as 270. The separations can be measured with a reticle at the eyepiece or with a micrometer attachment, which is beyond the scope of this article. Positions and separations of easy doubles can be made photographically or with CCD cameras. Close and difficult doubles are notoriously difficult to measure and require fine equipment and considerable expertise.

The brighter component of a double is normally the more massive, and thus will evolve faster. This is not always the case. If the stars are main sequence, the state of evolution is straightforward and the stars will follow a 'mass-luminosity' relationship. This, in a nutshell, means the brighter the star the more massive it is. Since the stars presumably formed at the same time, their respective evolutionary state is determined by their mass. This allows astrophysicists to determine many characteristics of the stars compositions and ages. The study of double stars is the very foundation of the field of astrophysics.

If the stars are very close there may be odd discrepancies to the mass law due to mass exchange and it's effect on their evolution. More of this is available in the astrophysics end of the field.

Enough for now. Perhaps, if interest is shown a bit more will follow.

BK

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Eggs In Space

- by Patrick L Barry

The sky will be filled with flying eggs on May 10, 2003, when a thousand students converge on The Plains, Virginia, for the first-ever national high school rocketry competition.

Called the Team America Rocketry Challenge http://www.rocketcontest.org, the competition sets the goal of flying a custom-built, two-stage rocket carrying two raw eggs to a height of exactly 1,500 feet, and then returning the eggs to the ground unbroken. The team that comes closest to 1,500 feet without breaking their eggs will win the national title.

The competition is being organized by the Aerospace Industries Association and the National Association of Rocketry (NAR). NASA administrator Sean O'Keefe will attend the final event.

"The idea is to get kids interested in the world of aerospace," says Trip Barber, director of the competition and vice-president of the NAR. "And they will learn some important lessons about the power of math and science-and cooperation and teamwork-along the way."

To develop their designs, the students first used computer simulator software provided by NAR. Then they had to apply old-fashioned ingenuity and craftsmanship to bring the design to life and flight testing to refine it.

Students constructed rocket bodies using a combination of hobby-store rocket kit parts and custom materials. A typical rocket might consist of cardboard tubes from paper-towel or wrapping-paper rolls, a pre-made nose cone, rocket-kit body segments cut to size, and light-weight, balsa wood fins. But the greatest challenge for many was designing the compartment for the eggs.

Some used plastic Easter eggs as casings, padding the inside with bubble wrap, foam peanuts, or even gelatin. Others decided not to "reinvent the wheel," making a cradle from the egg-crate material used for shipping eggs. Some chose to make larger, more powerful rockets big enough to carry the eggs inside, while others made smaller, more efficient rockets that have a bulging egg compartment mounted on top.

A hundred unique designs will be put to the test in Virginia. Only one will win. But for the students, the real prize has already been won: Learning an approach to problem-solving that works, whether you're launching eggs over a field or sending astronauts to Mars.

In the end, it's all about the future: Future technologies and the kids who will grow up to create them. Many advanced technologies

A Boeing Delta II (7326) rocket launched the New Millennium Program Deep Space 1 spacecraft on October 24, 1998.

Are you a kid? Would you like to build your own rocket? Visit NASA's Space Place and learn how to make a bubble-powered rocket! http://spaceplace.jpl.nasa.gov/rocket.htm. It won't take you to Mars, but it's a good way to get started.

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