CONSTELLATION

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

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President's View

The "O" word

Yes, "Observing". It's that time of the year when the "it's too cold" excuse doesn't fly anymore. It's not too cold, and the wonders of the sky await. You don't have to go far to take part. Just step outside with your eyes, your planisphere and perhaps a pair of binoculars. You'll quickly begin to pick out the constellations. Orion is all but gone, but Auriga, Gemini and Leo are still there in the West. Virgo is on the Meridian. And Bootes, Hercules and (later) the Summer Triangle are rising in the East. Of course, there are many more. Saturn sets quite early now, but Jupiter is still high and bright. And Mars is rising earlier each night, growing as we head toward the best opposition in August.

Clear Skies...

Antoine Pharamond
President, BMAA

'NASA Space Place' column inside on page five

Wednesday, May 7 at 8:00p - BMAA General Meeting at Peace Valley

Wednesday, May 21 at 8:00p - BMAA Business Meeting at Peace Valley

The next BMAA General Meeting is scheduled for Wednesday, June 4 at 8:00p

BMAA MESSAGELINE - 215/579-9973

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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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Observing Tips

May 2003

- by Bernie Kosher

The weather has not cooperated well this late winter/early spring. Lots of clouds and of course the bitter cold of the earlier months. Much turbulence when the sky has been clear.

I haven't done a lot of observing, other than planetary from the back yard. Even that has been poor due to the seeing conditions.

We currently are seeing Jupiter with its equator aimed at us and have had the opportunity to see mutual events of the satellites. Sadly, the few times it's been clear enough to watch, the sky has been poor. About every six years this presentation of Jupiter affords us the alignment necessary to see the satellites eclipse and occult each other. The current apparition is drawing to an end, so I hope to get some better chances,

So what to talk about this time?

I find one of the celestial sights has not been mentioned much in these columns. One of my personal choices for getting out in the back yard, even though there is no chance of any deep sky observing due to poor transparency, moonlight etc, is double stars, so I'll ramble on a bit about doubles this time.

Even if the sky is hazy, or moonlit, there is still a fine field in double star viewing. In my own case there is no attempt to record or catalog them, I just do it for enjoyment and as a good reason to get outside. A side benefit is learning the constellations and some of the fainter star patterns. Aside from which, I find them attractive in their own right. Many are colored and rather striking.

The sun, as a single star, is actually in the minority as stars go. Current estimates of stars being double or multiple run upwards of 50 percent. Even if we accept 50 percent as a low average, that would indicate that 2/3 of the stars are members of multiple systems. So there.

So what constitutes a true double? Where does one draw the line on whether two stars at some given distance are a 'double'? One arcsecond? Two? Fifty?

I have no good answer for this.

The criteria used by various authorities are as varied as any other field where perception is the rule. Older books quoted 10 arcseconds or closer of separation. But if the two stars are nearby, say 32 light years, they will also be fairly close together intrinsically. If the same 10 seconds applies to stars at 3200 light years they will be very far apart indeed.

Since one arcsecond is the radius of the Earth's orbit at one parsec (one parsec = 3.2 light years), it follows that these stars at 32 light years would be separated 10 AU (Astronomical Unit), which is about the distance of the Sun to Saturn. Stars this close could well be bound gravitationally and form a true double. Stars bound by gravity are termed 'binaries'. The other pair would be separated by 1000 AU, an enormous distance.

So as a criteria we will stick to true binaries. Doubles not bound by gravity are referred to as 'optical' doubles and will only be mentioned a bit.

Just because the stars we see in the night sky do not appear double or multiple in our scopes does not mean, of course, they are not a true binary. To see the separate stars we need them to be far enough apart to appear as distinct Airy disks in our scopes, and the seeing must be good enough allow us to see each as a separate entity.

The Airy disk is the apparent disk of light, which our scope shows, and is limited in size by the aperture, a law of physics. Let's not go there other than to give the simple formula for the size of the disk. On a perfect night with perfect optics the Airy disk will be about 4.5" divided by the scopes aperture in inches. Thus a six-inch scope would show discs about 4.5/6 or about 0.7 arcseconds in size. If two stars are separated by this amount, the disks will overlap and appear as an elongated figure eight. Separation is measured from the star’s true position, so the separation is center to center of the disks.

- continued, next page -

In reality the Airy disk contains about 87 percent of the light of the star and the rest is distributed in rings, the first being the brightest and dimming outward.

It follow that a larger aperture will show smaller disks, therefore the larger aperture will show stars which are closer together as separated.

In a quirk of optics, if the scope has a large central obstruction, the central disk becomes smaller and more of the light is shoved into the rings. Therefore, a reflector with a large secondary mirror will theoretically separate a closer double than a perfect refractor. Well, there goes the old saw of resolving doubles as a true test of the scope's performance. This light thrown into the rings also will cut contrast tremendously, so while the reflector will do well on doubles, the refractor will outperform it on planets, all other things being equal.

But we digress.

Another thing to mention as far as seeing the stars as a double is the magnitude. If the stars are very bright they will be bloated beyond their true size. If very dim they may not impress the retina enough and will appear as a blurry patch. This, by the way, is the source of the Messier object number 40 being called nebulous. The stars were too faint to be seen as stars in the small scopes used at that time.

If the stars are very different in magnitude they will be more difficult to separate due to irradiation from the brighter and also a physiological effect in the eye/brain system.

If the stars are very red they will have a larger apparent size than blue ones and will be more difficult.

How do we know a star is a double if they appear single in even the largest scopes?

The spectroscope will show the lines varying in wavelength at different points of the orbit as the stars will be moving towards and away from us at opposite sides of their orbit. Stars have been shown to be double when separated by just a few hundred thousand miles. Naturally, the closer the stars the faster they revolve around each other and the more the lines are spread. This is the 'red shift' and 'blue shift' you've heard so much about.

These are 'spectroscopic' binaries.

If a single stars real motion appears to drift to each side of a straight line, it is most likely due to gravitational attraction from an unseen companion. Even if the stars are far enough apart to be seen, theoretically, as a double in a scope, they may not show as one may be very much fainter than the other. This was the case with the famous companion to Sirius. It was known to have a companion, as its real motion was not a straight line, long before it's sighting by Alvan Clark. These stars may also not show in the spectrum as the lines of the faint star are swamped by the brighter. Also the companion may have a high rotation velocity and the lines will be smeared, or it could have smeared lines due to atmospheric turbulence.

These types are called 'astrometic' doubles.

In a few cases, the star is known double as the orbit is inclined at basically zero to our line of sight and the two stars dim and brighten in a regular rhythm as they mutually eclipse each other. These are the 'eclipsing' binaries of which Algol is the most famous.

Again, I see I have run on about theory and left observing behind. More next time.
BK

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

In Search of Alien Oceans

- by Patrick L Barry and Dr Tony Phillips

A robotic submarine plunges into the dark ocean of a distant world, beaming back humanity's first views from an alien ocean. The craft's floodlights pierce the silty water, searching for the first, historic sign of extraterrestrial life.

Such a scenario may not be as fantastic as it sounds. Many scientists believe that Jupiter's moon Europa conceals a vast ocean under its icy crust. If so, heat from the moon's interior-which would keep the ocean from freezing solid-may also drive subaquatic volcanoes and hydrothermal vents. On Earth, such deep-sea vents provide chemical energy for ecosystems that thrive without sunlight, and some scientists even suggest that Earthly life first got started around these vents.

So a warm Europan ocean spotted with thermal vents could be a natural incubator for life. That's why some scientists hope that someday we will send a probe to Europa that could bore through the ice and explore the ocean below like a submarine.

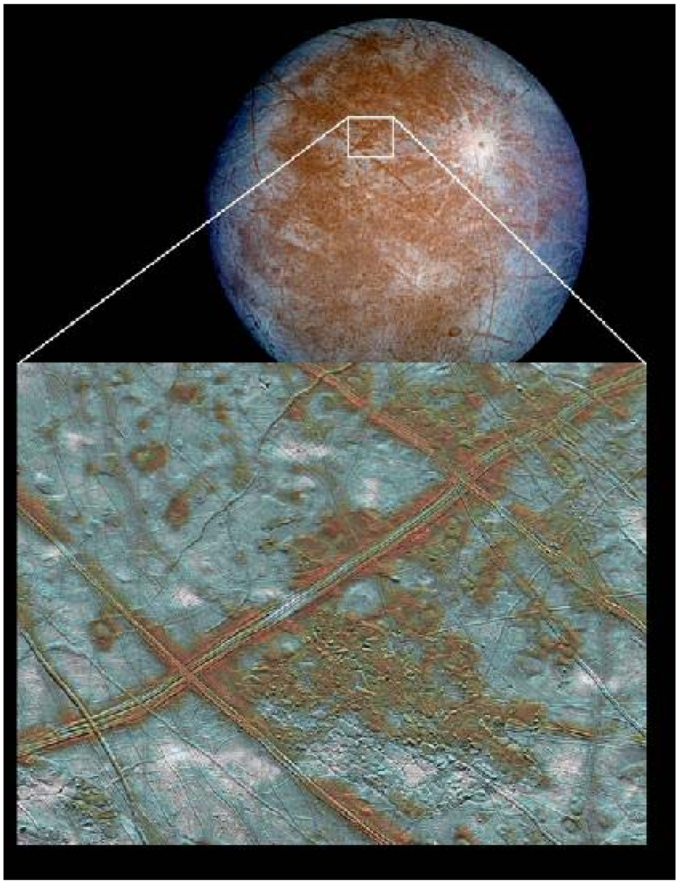
To plan for such a mission, scientists would first need to put a camera in orbit around Europa. By looking for places where water has welled up to fill the spindly cracks that riddle Europa's surface, scientists can estimate where the ice is thinnest-and thus easiest to bore through.

That mission scenario presents a problem, though. Europa orbits Jupiter inside the giant planet's punishing radiation belts. Continuous exposure to such high radiation would damage today's scientific cameras, making the information they gather less reliable and perhaps ruining them completely.

That's why NASA is designing a more radiation-tolerant CCD that could be used on a mapping mission to Europa. A CCD (short for "charge-coupled device") is a digital camera's chip-like core, which converts light into electric signals.

"We've seen the effects of this radiation during the Galileo mission to Jupiter," says JPL's Andy Collins, principal investigator for the Planetary Imager Project. "Galileo has orbited Jupiter for many years, dipping inside the radiation belts only for brief intervals.
Even so," he says, "we've seen clear signs of damage to its instruments."

By using the hardier CCD's developed by the Planetary Imager Project, a future probe could remain in Jupiter's radiation belts for many months, gathering the maps scientists will need to finally get a peek behind Europa's icy veil. And who knows, maybe there will be something peeking back!



Cracks on the icy surface of Jupiter's moon Europa give evidence of a liquid ocean below.

To learn more about the Galileo mission to the Jupiter system, visit http://www.jpl.nasa.gov/galileo/. For children, a fun, interactive "Pixel This!" game at http://spaceplace.nasa.gov/p_imager/pixel_this.htm introduces CCDs and how a really tough one will be needed for a future mission to Europa.

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