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Star Points for March 2008

March Comes in on a Lion

by Curtis Roelle

Winter hasn't ended, but looking ahead to spring can't hurt. After all, spring begins this month on Maundy Thursday, the 20th. In my opinion the most prominent constellation of spring is Leo the Lion. Leo is an ancient constellation whose association with the stars may have originated in Egypt, according to Giuseppe Maria Sesti's book *The Glorious Constellations*. In the dry season of the year, desert lions approached the Nile valley during the annual flood, while the sun was among the stars of Leo. A relationship between the Sphinx at Giza and Leo is suspected, and the debate over specific aspects of their relationship goes on. In one form of the debate, Graham Hancock and Robert Bauval, writing in "The Message of the Sphinx," interpret an ancient astronomical alignment between the Sphinx and Leo as evidence that the Sphinx was built around 10,500 B.C. The conventional belief is that the Sphinx was built some 8,000 years later in the 4th dynasty.

To view Leo and the spring sky during early March you must step outside at around 10 or 11 p.m. Fortunately, our good friend Saturn is there to help us find Leo. Saturn is the bright "star" very high in sky as you face southeast. By the way, a great time to look at Saturn with a telescope is when it's high in the sky, just as it is now. It will appear sharper, and its rings will be visible even in small telescopes at low power. Looking to Saturn's right you'll see the star Regulus about five degrees away (or about half the width of a human fist). *(Continued on page 3)*

In This Issue:

March Meeting: Wednesday, March 12, 2008, at 7:30 PM

Guest speaker Mark "Indy" Kochte, of JHU's Applied Physics Lab will tell us about the MESSENGER probe headed for Mercury. Read more about Mark, MESSENGER, and Mercury on page 4.

Observing: Messier Marathon postponed

Public Events:

March 14 – Planetarium Program and Star Party, Bear Branch Nature Center, 7:30 PM and possibly 8:30 PM

President's Message for March

by Stephen Reisinger

With the weather getting ready to change, the Regional Star Parties are about to swing into high gear. For anyone who has not yet gone to one of these outings, it's well worth your effort. The first one I went to was in New Jersey at Belleplain State Forest. This Star Party is held by the South Jersey Astronomy Club, and when I attended it, it was in late September. The second one I attended was the Mason-Dixon Star Party in Pennsylvania in October, two years ago. I was there for two nights, and I was fortunate to have missed the rain and wind.

The speakers are usually interesting, even if their talk is on a subject that you're not too familiar with. They are also available to answer questions afterwards. And of course, everyone looks forward to the raffle! Then there is the night sky. This is what everyone looks forward to the most. It's the best time to go after some of the more difficult objects on whatever list of objects you're attempting to see.

One object I'd be sure to look at this year is Saturn. If you can't take a picture of it, I'd draw it. It's not difficult, and it's true that by drawing what you see, you do indeed start to see more detail. You don't have to be an artist. I recommend that you draw it now, and draw it again next year. I say this because until I got into this hobby I didn't know that the rings periodically "disappear". I understand that in most amateur telescopes the rings will not be visible because they'll be edge-on to our line of sight. So it'll be interesting, when we celebrate the International Year of Astronomy next year, to show people Saturn. They'll be looking for the rings around the most famous planet, and not be able to see them.

Be sure to get out and enjoy the night sky whenever you can.

Until next month ... Clear Skies,

Stephen

Star Points, continued

Regulus represents the lion's heart. It marks the "handle" in a sickle-shaped asterism of stars forming the lion's head. The sickle resembles a backward question mark, with Regulus representing the dot at its bottom. Left of the sickle you'll see a right triangle of stars representing the lion's hindquarters. Denebola is the leftmost of these three stars.

To amateur astronomers Leo is a happy hunting ground for galaxies. Leo contains five galaxies that were included in a catalog compiled by the 18th century French comet hunter Charles Messier. In fact, you can use Regulus, a low power eyepiece, and a clock to find two of them in just about all but the smallest of telescopes. But it takes patience and time.

First, make sure you are using your telescope's lowest power eyepiece. The longer the focal length, the lower the power. Compare the numbers shown on each eyepiece to determine which is your lowest power. (Hint: 25mm is lower power than 9mm.)

Second, put Regulus in your eyepiece. Then nudge the telescope a little bit downward toward the ground, keeping Regulus in the eyepiece field of view.

Third, let go of the telescope and start watching a clock or stopwatch. Don't touch the telescope at all, just let the earth's rotation do the work. About 35 minutes later you should see a faint small, hazy smudge in the eyepiece. This is Messier 95, a galaxy 33 million light-years away discovered in 1781. Carefully re-center the telescope on it and have a good look.

When you're done, let go of the telescope again and let it drift some more. After only two minutes or so, another small, faint, fuzzy blob will be drifting into the field of view. Now you're looking at Messier 96, a galaxy 31 million light-years away, discovered in the same year as Messier 95.

Easter falls on March 23 this year. The earliest that Easter can occur is March 22. According to Guy Ottewell's Astronomical Calendar 2008, the next time Easter falls on March 22 will be in the year 2285.

The Westminster Astronomical Society (WASI) will host a public star party at Bear Branch Nature Center (BBNC) in Carroll County on Friday, March 14. If you need assistance finding galaxies in Leo using the drift method described above, bring your telescope along and perhaps they can help. For details visit the calendar page at WestminsterAstro.org.

Star Points by Curtis Roelle appears in the Carroll County Times on the first Sunday of each month. Visit the website at:
http://members.fortunecity.com/starpoints/ or send email to StarPointsUSA@yahoo.com

Guest Speaker for March Meeting: Mark "Indy" Kochte

Topic: NASA'S Return Mission to Mercury

It has been over three decades since the Mariner 10 spacecraft did three flybys of the innermost planet to our Sun, Mercury, photographing 45% of its surface, and making enormous discoveries about this hot, hard-to-visit (or even observe) planet. But now there is a spacecraft, MESSENGER, barreling headlong towards Mercury. Launched in 2003, it will do three flybys of Mercury during 2008 and 2009, and go into orbit around the planet in 2011. During MESSENGER's first flyby, which took place just two months ago on January 14, MESSENGER had an opportunity to image a large swath of the heretofore unphotographed side of the planet, and saw things never before found elsewhere in our Solar System.

Aspects of the mission are to characterize the chemical composition of Mercury's surface, the geologic history, the nature of the magnetic field, the size and state of the core, the "volatile inventory" at the poles, and the nature of Mercury's exosphere and magnetosphere over a nominal orbital mission of one Earth year. Scientists also plan to test a theory that the planet is shrinking, contracting in on itself, as its core slowly freezes.

Travel to Mercury requires dealing with an extremely large velocity change, or delta-v, because Mercury lies deep in the Sun's gravity well. A spacecraft traveling to Mercury is greatly accelerated as it falls toward the Sun, and there must be a mechanism to slow it. Furthermore, because Mercury does not have an atmosphere, it is impossible to airbrake on arrival. The spacecraft must use rockets to slow down enough to go into orbit. To make the trip feasible, MESSENGER makes extensive use of gravity-assist maneuvers. These reduce the energy and fuel requirements, but greatly prolong the trip. An Earth swing-by in 2005, a first Venus flyby in 2006, a second flyby of Venus in 2007, a first flyby of Mercury a few weeks ago, and two more flybys of Mercury (October 2008 and September 2009) were designed to slow down the spacecraft for insertion into orbit in March 2011.

"MESSENGER" is a contrived name for the probe, an acronym standing for MErcury Surface, Space ENvironment, GEochemistry and Ranging. It links the "Messenger of the gods" in Roman mythology, wing-footed Mercury, with both the planet and the probe.

Our speaker, Mark Kochte, was born and raised in northeast Ohio, and got his degree in astronomy from the Ohio State University in 1987. Shortly afterward, he joined the Hubble Space Telescope project at the Space Telescope Science Institute in Baltimore, and worked on the acquisition, processing, and archiving of Hubble data. He also did some research in the studies of extrasolar planets, and was heavily involved in the grassroots project UMBRAS. In late summer 2005 he joined the FUSE (Far Ultraviolet Spectroscopic Explorer) project as a Mission Planner, and faced the immense challenges of dealing with a satellite that had only one reaction wheel remaining. In November 2006 he became a Payload Specialist on the MESSENGER Mission.

In his spare time, when not staring at the stars, Mark ("Indy") can be found scaling cliffs and mapping out caves in West Virginia, mountain climbing in Colorado and Washington, or diving for fossilized Megalodon shark teeth in the Atlantic. Please join him (and us) this Wednesday, March 12, as he takes us on a journey to one of the most elusive bodies in our Solar System, where not even the vaunted Hubble Space Telescope can peer.

SCIENCE CORNER: ***Equinox and Solstice – a Few Observations***

Schoolchildren are commonly taught that on the date of the equinox day and night are of equal length (12 hours) at all points on the Earth. While this is true in a general sense, it is oversimplified and misleading, because: 1) the effects of atmospheric refraction cause the sun to appear to rise earlier and set later than it actually does, geometrically speaking, everywhere on earth; and 2) the concept of "equinox" cannot apply at the poles. I will discuss each point in turn.

Atmospheric refraction. At the equator, for example, the daylight portion is about 12 hours 6 minutes long every day of the year. The equator has thus a virtual "perpetual equinox." The extra six minutes are thanks to atmospheric refraction. If there were no atmosphere, the equator would indeed have 12 hours of light and 12 hours of darkness each day, but with no atmosphere we would have considerable trouble staying alive! Because of the effects of refraction, the actual period of equal day and night occurs a few days *before* the astronomical spring equinox date, and a few days *after* the autumnal equinox date.

"Equinox" at the poles. Each pole has only one sunrise and one sunset per year. The sun rises at either pole about three days before the equinox date, thanks again to refraction. It stays up continuously, completely circling the horizon every 24 hours and spiraling slowly upwards to a maximum altitude of 23.5^{o} above the horizon at the solstice. It lingers at that height for a few days, and then reverses the process until it finally sets, about three days after the autumnal equinox. Since there is only one sunrise and one sunset per year, a pole cannot have a 12-hour day and a 12-hour night, except by a very artificial juggling of how to define dates at the poles, so as to "begin the day" while it is still dark, exactly 12 hours before the calculated sunrise, and then "end the day" 12 hours later. Such an attempt would be completely arbitrary, with no connection whatever to nature. [KNL]

"Stardust" in the Bible (KJV)…

Job 9:9 "…which maketh Arcturus, Orion, and Pleiades [Hebrew *Ash*, *Cesil*, and *Cimah*], and the chambers of the south."

Job 38:32 "...canst thou guide Arcturus [Heb. *Ash*, the constellation of the Great Bear] with his sons?"

Job 38:31 "Canst thou bind the sweet influences of Pleiades, or loose the bands of Orion?"

Amos 5:8 "…that maketh the seven stars and Orion…"

Acts 28:11 "And after three months we departed in a ship of Alexandria, which had wintered in the isle, whose sign was Castor [patron god of sailors] and Pollux [Roman god]"

MDA READERS: Do you know of any more, or do you know of any other interesting "astronomical" references in literature? Care to share?

Googols & Googolplexes … Out to the farthest star

Did you know that a "googol" is the number 10 raised to the 100^{th} power – that's the numeral 1 followed by 100 zeros, also written mathematically as 10^{100}. The American mathematician Edward Kasner (1878-1955) introduced the term, but credited its coinage to his nine-year-old nephew Milton Sirotta (1911-1981).

Kasner recounted in his book *Mathematics and the Imagination* that in 1920 or thereabouts, he and his two nephews were on a walk in the New Jersey Palisades. Kasner was eager to pique the children's interest in mathematics, and asked them to invent a name for a very big, yet finite, number consisting of the numeral 1 written with 100 zeros after it. Young Milton Sirotta suggested "googol." According to Kasner, on the same walk young Milton also coined a name for an even greater number – *much* greater – a "1" written with a "googol" of zeros behind it, (10^{GOOGOL}), and young Milton suggested "googolplex."

Kasner also wrote that, early on, someone whimsically suggested that a *googolplex* should be defined as "the numeral 1 followed by writing zeros until you got tired." This playful idea was rejected, though, because any lesser-ranking mathematician might be able to outdo the great Dr. Einstein simply because he had more physical endurance. After all, even though it is finite, a googolplex is an *extremely* large number. It's so big that, according to Kasner, there would not be enough room to write it, even if we went out to the farthest star, touring all the nebulas en route, and put down zeros every inch of the way!

In case you're wondering: the name of the Internet search engine "Google" originated from an alleged misspelling of the word *googol*. Also, the name of the Google company's headquarters, located near San Jose, California, is "The Googleplex."

And what became of Milton Sirotta? This is sad. He spent most of his life working in his father's factory in Brooklyn, NY, pulverizing apricot pits into an industrial abrasive.

[Extracted from "Edward Kasner" in Wikipedia. For more information, and citations, please see http://en.wikipedia.org/wiki/Edward_Kasner Also, "Google-ing *googol*" yielded close to 500,000 hits. Anyone care to add anything? Ed.]

If we build it, they will come…

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Invisible Spiral Arms

by Patrick Barry

At one time or another, we've all stared at beautiful images of spiral galaxies, daydreaming about the billions of stars and countless worlds they contain. What mysteries—and even life forms—must lurk within those vast disks?

Now consider this: many of the galaxies you've seen are actually much larger than they appear. NASA's Galaxy Evolution Explorer, a space telescope that "sees" invisible, ultraviolet light, has revealed that roughly 20 percent of nearby galaxies have spiral arms that extend far beyond the galaxies' apparent edges. Some of these galaxies are more than three times larger than they appear in images taken by ordinary visible-light telescopes.

"Astronomers have been observing some of these galaxies for many, many years, and all that time there was a whole side to these galaxies that they simply couldn't see," says Patrick Morrissey, an astronomer at Caltech in Pasadena, California, who collaborates at JPL.
The extended arms of these galaxies are too dim in visible light for most telescopes to detect, but they emit a greater amount of UV light. Also, the cosmic background is much darker at UV wavelengths than it is for visible light. "Because the sky is essentially black in the UV, far-UV enables you to see these very faint arms around the outsides of galaxies," Morrissey explains.

These "invisible arms" are made of mostly young stars shining brightly at UV wavelengths. Why UV? Because the stars are so hot. Young stars burn their nuclear fuel with impetuous speed, making them hotter and bluer than older, cooler stars such as the sun. (Think of a candle: blue flames are hotter than red ones.) Ultraviolet is a sort of "ultra-blue" that reveals the youngest, hottest stars of all.

"That's the basic idea behind the Galaxy Evolution Explorer in the first place. By observing the UV glow of young stars, we can see where star formation is active," Morrissey says.

The discovery of these extended arms provides fresh clues for scientists about how some galaxies form and evolve, a hot question right now in astronomy. For example, a burst of star formation so far from the galaxies' denser centers may have started because of the gravity of neighboring galaxies that passed too close. But in many cases, the neighboring galaxies have not themselves sprouted extended arms, an observation that remains to be explained. The

Galaxy Evolution Explorer reveals one mystery after another!

"How much else is out there that we don't know about?" Morrissey asks. "It makes you wonder." Spread the wonder by seeing for yourself some of these UV images at www.galex.caltech.edu.

Also, Chris Martin, principle scientist for Galaxy Evolution Explorer — or rather his cartoon alter-ego—gives kids a great introduction to ultraviolet astronomy at spaceplace.nasa.gov/en/kids/live#martin.

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