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## In This Issue

### Page One

The Hottest Planet in the Solar System

President's Article

Inside Stuff

4 Treasurers Report

4 Meeting Agenda

5 Astro-Imaging SIG

5 FAAC Equipment List

6 FAAC Meeting Minutes  
- April 24, 2014

## The Hottest Planet in the Solar System

By Dr. Ethan Siegel

When you think about the four rocky planets in our Solar System—Mercury, Venus, Earth and Mars—you probably think about them in that exact order: sorted by their distance from the Sun. It wouldn't surprise you all that much to learn that the surface of Mercury reaches daytime temperatures of up to 800 °F (430 °C), while the surface of Mars never gets hotter than 70 °F (20 °C) during summer at the equator. On both of these worlds, however, temperatures plummet rapidly during the night; Mercury reaches lows of -280 °F (-173 °C) while Mars, despite having a day comparable to Earth's in length, will have a summer's night at the equator freeze to temperatures of -100 °F (-73 °C).

*(continued on Page 3)*

## President's Article

By Tim Campbell

### Coordinate Systems and the First Point of Aries

In astronomy, we can locate the positions of objects we'd like to observe based on two different coordinate systems. I thought I'd write about these two systems and then write briefly about the history and significance of one of them.

### The Altitude/Azimuth System

The simpler system to understand is the altitude/azimuth system. Very simply, the "altitude" is the angular height of an object above the horizon line while the azimuth is the direction or compass-bearing to the point on the horizon. If an object has a alt/az coordinate of 90° azimuth, 45° altitude, you simply swing your telescope to point to true east (90°) and angle it up 45° and you're there. The question is, what will you see in that spot?

*(continued on Page 2)*

# STAR STUFF

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STAR STUFF is published eleven times each year by:

**FORD AMATEUR ASTRONOMY CLUB**  
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### Club Information:

The Ford Amateur Astronomy Club (FAAC) meets on the fourth Thursday each month, except for the combined November/December meeting on the first Thursday of December - at Henry Ford Community College Administration Services and Conference Center in Dearborn. Refer to our website for a map and directions ([www.fordastronomyclub.com](http://www.fordastronomyclub.com)).

The FAAC observes at Spring Mill Pond within the Island Lake State Recreation Area near Brighton, Michigan. The club maintains an after-hours permit, and observes on Friday and Saturday nights, and nights before holidays, weather permitting. The FAAC also has use a private observing site near Gregory Michigan and lake Erie Metro Park. See the FAAC Yahoo Group\* for more information.

Observing schedules and additional info are available on our website, or via the FAAC Yahoo Group.\* Or call the FAAC Hotline, for info and leave a message, or ask questions: 313-757-2582. or send email inquiries to [info@fordastronomyclub.com](mailto:info@fordastronomyclub.com).

Membership in the FAAC is open to anyone with an interest in amateur astronomy. The FAAC is an affiliate of the Ford Employees Recreation Association (F.E.R.A.). Membership fees:

Annual - New Members: \$30 (\$15 after July 1)  
Annual - Renewal: \$25 (\$30 after January 31)

Membership includes the STAR STUFF newsletter, discounts on magazines, discounts at selected area equipment retailers, and after-hours access to the Island Lake observing site.

### Astronomy or Sky & Telescope Magazine Discounts

Obtain the required form from the FAAC club treasurer for a \$10 discount. Send the completed form directly to the respective publisher with your subscriptions request and payment. Do not send any money directly to the FAAC for this.

### Star Stuff Newsletter Submissions

Your submissions to STAR STUFF are welcome! Send your story and/or images to the editor: [StarStuff@fordastronomyclub.com](mailto:StarStuff@fordastronomyclub.com) Email text or MS Word is fine. STAR STUFF will usually go to press the weekend prior to each general meeting. Submissions received prior to the 15th can be included in that issue.

\* FAAC Members are welcome to join our Ford Astronomy Club

*This months background photos of the moon Page 1 courtesy of John Kirchhoff. See more of John's photos at:*

<http://www.flickr.com/photos/33926475@N06/with/4311533997/>

The answer is... I have no idea. This is the "problem" with the alt/az system. The system defines a fixed position relative to your current point on the Earth. But the Earth is constantly spinning while it also orbits the Sun. So what you'll see at that position depends entirely on where you are on the Earth, as well as the date and time of the observation. While it's a simple way to describe a position, if two observers are viewing the same object at the same time, but one is located in Michigan and the other is located in Florida, they will each have a different Alt/Az coordinate for the same object on the same date and time. The system has no repeatability in that you cannot depend on the coordinates to point the same object night after night, or location after location. While the benefit of the system is that it is very easy to understand, the downside of the system is that it is nearly worthless for use in object catalogs.

This brings us to the alternative.

## The Right-Ascension/Declination System

In the Right-Ascension/Declination System (or RA/Dec), the problem of repeatability is solved because most of the system is based on relative positions of objects to other known, measurable, and essentially fixed positions in the sky. We don't rely on positions on the Earth nor on dates or times in order for the system to work.

This system uses relative positions based on Earth's latitudes to define the declination component. If a star appears to be directly above Earth's north pole, that star would have a declination of +90° (Polaris is the closest at approximately 89° 20'). If a star appears somewhere along the line in the sky directly above Earth's equator, that star has a declination of 0°. Stars appearing above southern hemisphere latitudes have negative declinations. This declination component works because the Earth's 23.5° tilt on it's axis remains oriented in the same direction all year long and year after year... almost (more on that shortly.)

(continued on Page 7)



*Image credit: NASA's Pioneer Venus Orbiter image of Venus's upper-atmosphere clouds as seen in the ultraviolet, 1979.*

## The Power of the Sun's Engines

*(continued from Page 1)*

Those temperature extremes from day-to-night don't happen so severely here on Earth, thanks to our atmosphere that's some 140 times thicker than that of Mars. Our average surface temperature is 57 °F (14 °C), and day-to-night temperature swings are only tens of degrees. But if our world were completely airless, like Mercury, we'd have day-to-night temperature swings that were hundreds of degrees. Additionally, our average surface temperature would be significantly colder, at around 0 °F (-18 °C), as our atmosphere functions like a blanket: trapping a portion of the heat radiated by our planet and making the entire atmosphere more uniform in temperature.

But it's the second planet from the Sun -- Venus -- that puts the rest of the rocky planets' atmospheres to shame. With an atmosphere 93 times as thick as Earth's, made up almost entirely of carbon dioxide, Venus is the ultimate planetary greenhouse, letting sunlight in but hanging onto that heat with incredible effectiveness. Despite being nearly twice as far away from the Sun as Mercury, and hence only receiving 29% the sunlight-per-unit-area, the surface of Venus is a toasty 864 °F (462 °C), with no difference between day-and-night temperatures! Even though

Venus takes hundreds of Earth days to rotate, its winds circumnavigate the entire planet every four days (with speeds of 220 mph / 360 kph), making day-and-night temperature differences irrelevant.

Catch the hottest planet in our Solar System all spring-and-summer long in the pre-dawn skies, as it waxes towards its full phase, moving away from the Earth and towards the opposite side of the Sun, which it will finally slip behind in November. A little atmospheric greenhouse effect seems to be exactly what we need here on Earth, but as much as Venus? No thanks!

Check out these "10 Need-to-Know Things About Venus":

<http://solarsystem.nasa.gov/planets/profile.cfm?Object=Venus>.

Kids can learn more about the crazy weather on Venus and other places in the Solar System at NASA's Space Place: <http://spaceplace.nasa.gov/planet-weather>.

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

## Treasurer's Report

May 13, 2014

By Gordon Hansen

May 13, 14

### ASSETS

#### Current Assets

##### Checking/Savings

10000 · Checking 1,103.40

##### 11000 · FAAC Savings

11100 · FAAC Club Savings 2,593.06

11200 · Equipment 1,204.36

11300 · Scholarship 560.76

11400 · GLAAC 4,359.56

11000 · FAAC Savings - Other 1.90

Total 11000 · FAAC Savings 8,719.64

12000 · Petty Cash Account 98.88

##### 13000 · CD's

13100 · CD 200599272 1,059.51

13200 · CD 205196033 1,004.02

13300 · CD 89265268 1,106.97

Total 13000 · CD's 3,170.50

Total Checking/Savings 13,092.42

Total Current Assets 13,092.42

## Meeting Agenda - May 22th

\*\*\*HFCC – Ghafari Conference Room –  
Technology Building\*\*\*\*

[www.fordastronomyclub.com](http://www.fordastronomyclub.com)

5:30

### Opening/Introduction/Member Observing

#### Main Presentation:

Ask the Astronomer All

#### Tech Talk:

Sky Safari 4 and Telescope Control with Mobile  
Devices Tim Campbell

### Club Projects/Committees/Member Support

### Club Business/Secretary/Treasurer/Equipment Reports

### Club Wear

You can order online from LL Bean, using the instructions contained in a file that you can view on our club Yahoo Group website Club Wear file folder at

<http://tech.groups.yahoo.com/group/FordAstronomyClub/files/Club%20Ware/>

### Classified

Meade LX200GPS – 8 inch SCT with a Scope Buggy dolly.

Asking \$1800

Contact: Joan Onkka, 734-525-0228

Orion SkyQuest XT10 Classic Dobsonian  
Asking \$350

Contact: Gordon Hansen, 734-624-1102  
or on Yahoo

## Astro Imaging SIG

Gordon Hansen

All are invited to join us in the Astro Imaging SIG meetings, to share and discuss images, experiences, and techniques.

We always have a good time, with lively discussion, and sharing of valuable information.

Next meeting is **June 12th**. The meeting room location – HFCC Admin. Services and Conference Center (same building), Berry Amphitheater Auditorium.

Topics invited. Pizza served.

## FAAC Events 2014

**May 22nd - Next General Membership Meeting in HFCC Technology Building / Ghafari conference room (this meeting only)**

**May 29th – 7pm. Grosse Pointe North High School Radio Astronomy Open House. 707 Vernier Rd. Grosse Point Woods.**

**June 5th – 5pm. FAAC Board Meeting at Senate Coney Island**

**June 7th – Beginner's Night at Island Lake State Park / Spring Mill Pond  
Sunset is at 9:07pm.**

*Background Photo from Lunt Solar Scope Image taken at the Hector J Robinson Observatory, June 28, 2010*

### One FAAC members blog

<http://hjrobservatory.blogspot.com/>

A few updates on the observatory, quick articles and photos. I'll try to improve my writing on this blog. Also, I try to keep daily updates on this blog. - Greg Knekleian, HJRO volunteer.

## FAAC Equipment Report 5/14/14

By Dennis Salliotte

<u>Item</u>	<u>Currently Held By:</u>	<u>Date Last Verified</u>
<b><u>Telescopes</u></b>		
4" Dobsonian	George Korody	1/18/14
4 ½ " Galileo Alt/Az Reflector	James French	5/10/14
8" Orion 8XTi Dobsonian	James French	5/10/14
4" Donated Reflector in need of repair	George Korody	1/18/14
<b><u>Presentation Tools</u></b>		
Projector	Gordon Hansen	1/8/14
Projection Screen 8'	Bob MacFarland	2/13/14
Speaker System w/wireless mic	Bob Mac Farland	2/13/14
Bullhorn	George Korody	1/18/14
DVD Player	Gordon Hansen	1/8/14
Projection Screen 6'	Gordon Hansen	1/8/14
Projector, ViewSonic	Gordon Hansen	4/11/14
<b><u>Demonstration Tools</u></b>		
Weight On Planets Scale	George Korody	1/18/14
Lunar Phase Kit	Bob MacFarland	2/13/14
100 ft Scale Model Solar System Kit	Bob MacFarland	2/13/14
<b><u>Display Items</u></b>		
Astronomy Event Sign (3' X 6')	Gordon Hansen	4/15/14
PVC Display Board - Folding	Tim Campbell	5/13/14
Banner – Large (32" X 16')	Dennis Salliotte	5/13/14
Banner – Medium (24" X 72")	George Korody	3/15/14
Banner – Small (24" X 32")	George Korody	3/15/14
Tri-Fold Presentation Boards	Don Klaser	1/23/14
Tri-Fold Poster Board (Early Club Photos)	George Korody	1/18/14
<b><u>Other</u></b>		
Sky Quality Meter	Syed Saifullah	3/15/14
Canopy (10' X 10')	Greg Ozimek	2/6/14
Equipment Etching Tool	Gordon Hansen	4/22/14
Pop Cooler	Michael Dolsen	1/23/14

# FAAC General Meeting Minutes April 24th, 2014

By Ellen Duncan

## Opening:

Tim C called the meeting to order at 5:33. Everyone introduced themselves. There were at least five new people attending. Tim explained about the club's mentoring program and the club's loaner telescope.

Members told about observing experiences from last month.

## Business Meeting:

- Dennis S gave his report on the club's equipment. Any member may borrow club equipment. The would-be borrower should contact the person who has the item/s (listed on the Yahoo group site). The borrower may also contact Dennis for assistance.
- Ellen D gave the secretary's report, which is published in Star Staff. Gordon H gave the treasurer's report, also published in Star Stuff, and mentioned that the club just purchased a new projector, funds for which had been approved at the last board meeting. He also encouraged people to sign up for the May 17 club banquet, as time is running out.

## Projects and Events:

- May 10—Astronomy Day at Kensington and the Michigan Science Center (10 - 4ish)
- May 10—Beginner's Night at Island Lake Recreational Area, Spring Mill Pond location (starting about an hour before sunset)
- May 17—Annual Club Banquet at Karl's Cabin (Buy tickets through Gordon)
- May 22—General meeting at a different location on campus of HFCC (see below)

## Important Announcements:

**THE MAY 22 GENERAL MEETING WILL BE HELD IN THE HFCC TECHNOLOGY BUILDING,**

**in the Ghafari Conference Room. The following meeting will be back in the normal location.**

The meeting then adjourned to the planetarium for "What's Up in May" and the main talk for remainder of the time.

## President's Article

By Tim Campbell

*(continued from Page 2)*

This brings us to the right-ascension component. This one is mildly trickier. The right ascension doesn't use degrees... it uses hours and minutes, like the time on a clock. The RA "clock" does indeed have 24 "hour" components in it. But the clock is not based on a solar day... instead it is based on a sidereal day. A sidereal (pronounced: sī'di(ə)rēəl) day is roughly 4 minutes shy of a standard 24 hour solar day. This is because a sidereal day is defined as the amount of time it takes the Earth to complete exactly one full rotation on its axis (using a distant star ... not our sun ... as a way to measure when the rotation is completed.) But in that same amount of time, the Earth will have moved forward in its approximately 365¼ day orbit around the Sun — by just shy of 1°. This means the Sun isn't at precisely the same location relative to other stars in the sky — so it would be difficult to use the position of the Sun at a fixed time each solar day as the 00 hour time for astronomical purposes. That's why we use the sidereal day instead. It uses a fixed point in the sky which never changes throughout the year. But we do use the Sun as the basis for that position.

That brings us to the next part of the story.

### The First Point of Aries

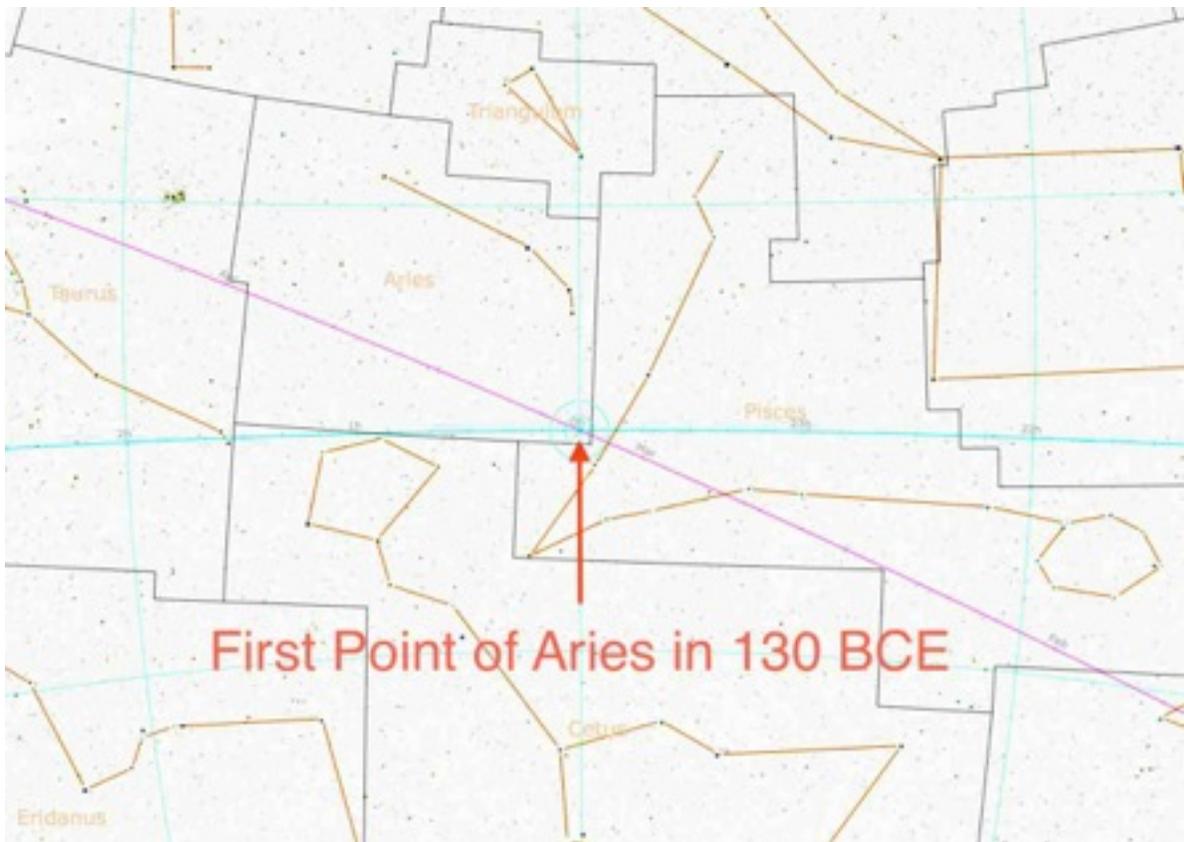
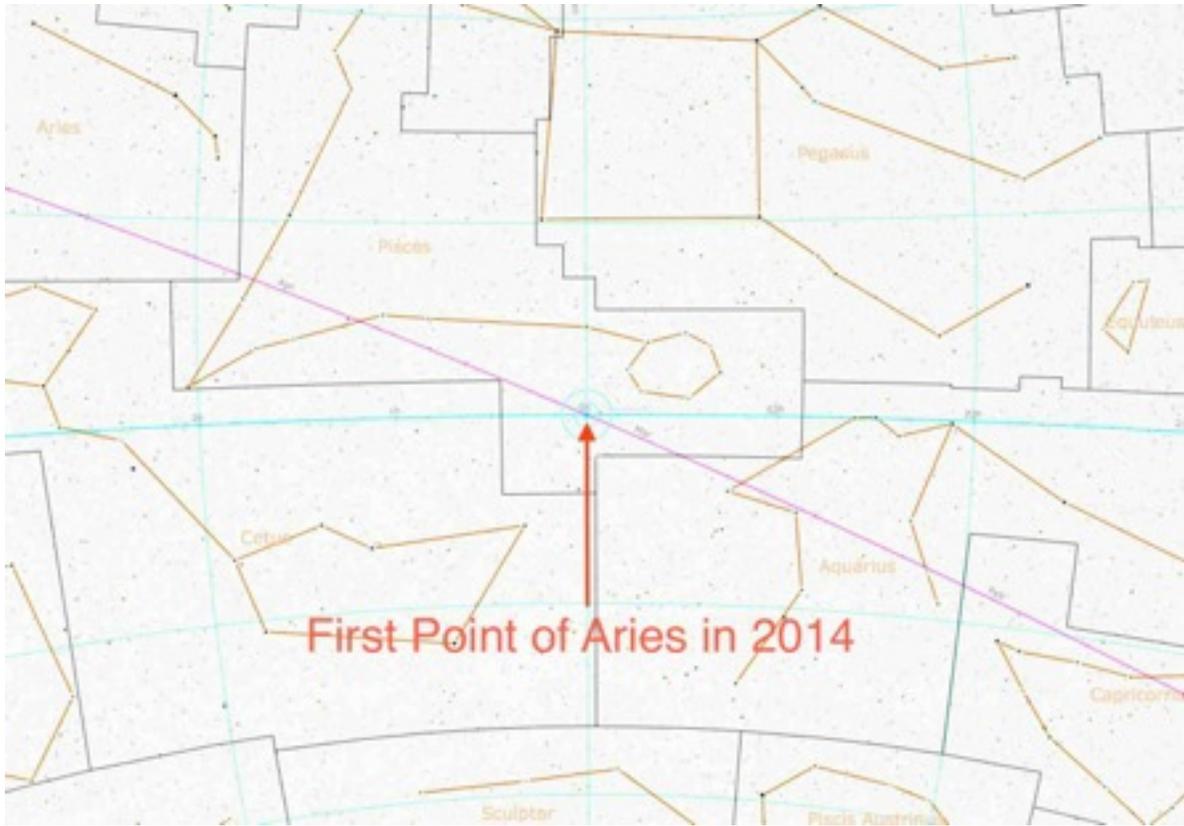
As the Earth orbits the Sun, the Sun appears in a slightly different spot in the sky each day — relative to the background stars that we can't see when the Sun is up because the Sun is ultimate

source of light pollution. But if you were to plot the position of the Sun in the sky relative to those background stars on each day of the year and then connect the dots, the line that you would have just drawn through your sky atlas is known as the Ecliptic. It is the apparent path of the Sun throughout the year.

Each spring, at the point of the Vernal Equinox, the Sun crosses the Earth's equator... one minute it appeared to be over the southern hemisphere, and the next minute it has crossed the line into the northern hemisphere... and we all declare that spring has officially begun. But at that moment... the moment of the vernal equinox, astronomers define another key point in the sky... the point at which the Sun crosses the equator is known as the First Point of Aries. This is the basis of the RA/Dec system.

As mentioned above, the declination 0° line is simply the imaginary line in space which appears directly above Earth's equator. But the 00 hour line (longitudinally) is the position where the Sun happens to be in the sky at the moment of the vernal equinox. The First Point of Aries is the position of RA 0h 0m 0s / Dec 0° 0' 0". The hours of right-ascension are all based on relative positions from this point... and the point will be the same year after year. Well... almost.

*(continued on Page 8)*



## President's Article

By Tim Campbell

*(continued from Page 7)*

Pull up any computer planetarium program and switch on the celestial grid (or equatorial grid) and notice where the line of  $0^\circ$  declination is located. Now also switch on the ecliptic and notice you get a lop-sided ring which is partially above and partially below the declination  $0^\circ$  line on the equatorial grid. It intersects in two places... one location is in Pisces, and the other is in Virgo. The First Point of Aries is the one located in Pisces... where the ecliptic intersects with the celestial equator at the spring equinox. The other intersection point is the location where the sun crosses the equator again at the autumnal equinox.

Where is Aries in all of this? Well... Aries is located just to the left of Virgo.

Your next logical question may be: Why is it named the First Point of Aries if it's actually located in Virgo?! I'm glad you asked!

The answer is in history. The point was defined by Hipparchus back in the year 130 BCE. At that time, this intersection point actually was located in Aries. It was located near the lower western corner of the constellation boundary for Aries... at the point along the ecliptic path located just inside the constellation of Aries. Hence "First Point" of Aries because it was near the location where the Sun first enters into the constellation's boundary.

It turns out the Earth's  $23.5^\circ$  angle of tilt does not maintain exactly the same orientation through the year, every year. The Earth actually wobbles on it's axis... like a top. This wobble takes a very long time to complete just one complete

circular rotation of the wobble... a little over 25,000 years. This cycle is called precession and it's such a long period cycle that in the scale of a human lifetime, we almost don't notice it happening at all. After about 70 years, the position of the First Point of Aries (the Ecliptic/Equator intersection point) will have migrated west by about  $1^\circ$ . In the 2144 years since Hipparchus defined the point, the intersection has now migrated more than  $30^\circ$  from the original First Point of Aries.

And that is why the First Point of Aries is now located in Virgo. In the year 2600 the point will be located in Aquarius.

Since the slow migration of the point is almost not noticeable (on the scale of a human lifetime it only moves by about  $1^\circ$ ) it makes a very good foundational point in a universe (as viewed by Earthlings) where everything is moving all the time anyway — even the background stars are moving relative to each other. Star charts have to be updated to account for this, and so does the First Point of Aries.

The advantage of the RA/Dec system is that it can be used to locate the position of any object, by any observer, on any day of the year. Not only do two observers use the same RA/Dec coordinate for the same object from different viewing locations on Earth... they may even use the same coordinate at different times and dates during the year... and the system always works.

*(continued on Page 9)*

Ford Amateur Astronomy Club  
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