



Volume 24, Number 3

March 2014

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Old Tool, New Use: GPS and the Terrestrial Reference Frame

By Alex H. Kasprak

Flying over 1300 kilometers above Earth, the Jason 2 satellite knows its distance from the ocean down to a matter of centimeters, allowing for the creation of detailed maps of the ocean's surface. This information is invaluable to oceanographers and climate scientists. By understanding the ocean's complex topography—its barely perceptible hills and troughs—these scientists can monitor the pace of sea level rise, unravel the intricacies of ocean currents, and project the effects of future climate change.

But these measurements would be useless if there were not some frame of reference to put them in context. A terrestrial reference frame, ratified by an international group of scientists, serves that purpose. "It's a lot like air," says JPL scientist Jan Weiss. "It's all around us and is vitally important, but people don't really think about it." Creating

such a frame of reference is more of a challenge than you might think, though. No point on the surface of Earth is truly fixed.

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President's Article

By Tim Campbell

Each year, the Southern Cross Astronomy Club out of Miami Florida hosts the Winter Star Party in the Florida Keys. This is recognized as one of the top-ten star parties in the world. Several of our club members decided we would "suffer for science" by attending this year's star party.

This winter has been particularly brutal to Michigan astronomers with clear nights being especially cold. Of course we've had no shortage of snow either. So I confess that getting a break from the weather was a welcome thought. Everyone was under strict orders that there would be no complaining about the heat.

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STAR STUFF

March 2014 - Vol. 24 No 3

STAR STUFF is published eleven times each year by:

FORD AMATEUR ASTRONOMY CLUB
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Dearborn MI 48121-7527

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SECRETARY: Ellen Duncan
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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).

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.

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 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 Yahoo!Group. Messages photos, files, online discussions, and more! URL: groups.yahoo.com/group/FordAstronomyClub.

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

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

This was my first time attending the Winter Star Party (or any star party outside the state), but I was in good hands with fellow club members to help indoctrinate me into the ritual that is the Winter Star Party. Jim Moscheck, Chuck Jones, Mike Dolsen, Dennis Salliotte, George & Pat Korody, and Leon Shaner were there as well.

If you've never attended the WSP, this is an experience I think any astronomer would enjoy. But as this was my first time... everything was a new experience for me.

There is a bit of a ritual to get into the star party. The event officially opens at 12 o'clock noon on the first day of the event... there is quite a substantial line of cars along the side of the highway awaiting the opening. Officially, attendees are not supposed to line up before 6am. But unofficially, everyone begins lining up somewhere around midnight. Our own Jim Moscheck was #4 in line. Chuck Jones & Mike Dolsen were #5 in line. (I was #40 in line, Dennis Salliotte was #47, and George & Pat Korody were too far back that I lost count.) When the gates open, Dennis Salliotte describes the scene as an "Oklahoma Land Rush" as astronomers race to claim their spots along the beach.



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Artist's interpretation of the Jason 2 satellite. To do its job properly, satellites like Jason 2 require as accurate a terrestrial reference frame as possible. Image courtesy: NASA/JPL-Caltech.

Old Tool, New Use: GPS and the Terrestrial Reference Frame

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To create a terrestrial reference frame, you need to know the distance between as many points as possible. Two methods help achieve that goal. Very-long baseline interferometry uses multiple radio antennas to monitor the signal from something very far away in space, like a quasar. The distance between the antennas can be calculated based on tiny changes in the time it takes the signal to reach them. Satellite laser ranging, the second method, bounces lasers off of satellites and measures the two-way travel time to calculate distance between ground stations.

Weiss and his colleagues would like to add a third method into the mix—GPS. At the moment, GPS measurements are used only to tie together the points created by very long baseline interferometry and satellite laser ranging together, not to directly calculate a terrestrial reference frame.

“There hasn’t been a whole lot of serious effort to include GPS directly,” says Weiss. His goal is to show that GPS can be used to create a terrestrial reference frame on its own. “The thing about GPS that’s different from very-long baseline interferometry and satellite laser ranging is that you don’t need complex and expensive infrastructure and can deploy many stations all around the world.”

Feeding GPS data directly into the calculation of a terrestrial reference frame could lead to an even more accurate and cost effective way to reference points geospatially. This could be good news for missions like Jason 2. Slight errors in the terrestrial reference frame can create significant errors where precise measurements are required. GPS stations could prove to be a vital and untapped resource in the quest to create the most accurate terrestrial reference frame possible. “The thing about GPS,” says Weiss, “is that you are just so data rich when compared to these other techniques.”

You can learn more about NASA’s efforts to create an accurate terrestrial reference frame here: <http://space-geodesy.nasa.gov/>.

Kids can learn all about GPS by visiting <http://spaceplace.nasa.gov/gps> and watching a fun animation about finding pizza here: <http://spaceplace.nasa.gov/gps-pizza>

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

March 6, 2014

By Gordon Hansen

Mar 6, 14

ASSETS

Current Assets

Checking/Savings

10000 · Checking \$ 1,274.40

11000 · FAAC Savings

11100 · FAAC Club Savings \$ 690.01

11200 · Equipment \$ 1,783.64

11300 · Scholarship \$ 528.21

11400 · GLAAC \$ 3,759.56

Total 11000 · FAAC Savings \$ 6,761.42

12000 · Petty Cash Account \$ 111.33

13000 · CD's

13100 · CD 200599272 \$ 1,058.98

13200 · CD 205196033 \$ 1,003.82

13300 · CD 89265268 \$ 1,106.16

Total 13000 · CD's \$ 3,168.96

Total Checking/Savings \$ 11,316.11

Total Current Assets \$ 11,316.11

TOTAL ASSETS \$ 11,316.11

Meeting Agenda - March 27th

HFCC – Berry Auditorium -Admin. Services & Conference Center www.fordastronomyclub.com
5:30

Opening/Introduction/Member Observing

Main Presentation:

Extra Terrestrial Intelligence Dale Partin

Tech Talk:

Winter Observing from Indoors Greg Knekleian

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/>

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 **April 10th**. The meeting room location – HFCC Admin. Services and Conference Center (same building), Berry Amphitheater Auditorium.

Topics invited. Pizza served.

FAAC Events 2014

March 29th – John Kirchoff Messier Marathon at Lake Hudson (possible alternate on Friday)

April 5th D-Bar-A Scouting all-clubs astronomy event

April 15th – (Night of April 14) Full Lunar Eclipse

May 10th - Astronomy Day

May 17th - Annual Club Banquet

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.

Member Photos



Above: Photo taken by Greg Knekleian through Ken Anderson's large Dob. No processing. 20mm Ethos eyepiece in lens discovery.

REMINDER: FAAC membership renewals were due by January 31, 2014.

Annual – New Member: \$30

Annual – Renewal: \$25 (\$30 after January 31)

Send your check for \$25 to:

FAAC
P.O. Box 7527
Dearborn, MI 48121-7527

Or bring your money to the FAAC General Meeting at 5:30 PM in the Berry Amphitheater Auditorium in the Administrative Services and Conference Center on the campus of Henry Ford Community College.

If you have a new Address, Phone Number or e-Mail address please include that information with your renewal.

Membership includes the STAR STUFF newsletter, discounts on magazines, discounts at selected area equipment retailers, and after-hours access to the Island Lake and Lake Erie Metropark observing sites, use of the FAAC Yahoo Group, and mentoring program.

FAAC General Meeting Minutes February 27th, 2014

By Jim Frisbie

Opening:

President Tim C. reported in via Skype from the Winter Star Party in Marathon Key, Florida. The meeting was called to order in the Berry Auditorium at 5:35 pm by Vice President, Art P. All attendees introduced themselves. No new members were present. A guest was welcomed. The Club Mentoring Program was described.

Observing Experiences:

Members contributed their observing experiences. Cold weather, Venus, Solar Observing, Sun Spots, WSP, and Cape Star Party were discussed.

What's Up in March:

John S. presented via Skype using Stellarium. April 15th will be a total eclipse.

Main Presentation:

"Close Encounters with Great Telescopes Around the World" was presented by Dr. Jerry D., Prof. Emeritus of Wayne State University.

Tech Talk:

"A Guide to Messier Marathon" was presented by Jim F.

Business Meeting:

- Club Equipment Report – Dennis at WSP
- Secretary's Report in Star Stuff - Approved
- Treasurers Report in Star Stuff - Approved

Projects and Events:

- Mar 15 – FAAC Show & Swap
- Mar 26 – 8am to Noon, Solar Observing at West Middle School
- Mar 29/30 – Messier Marathon at Lake Hudson
- Apr 5 – Astronomy Activity at D-Bar Telescope Site
- Apr 5 – Beginners Night at Lake Erie Site
- Apr 12/22 – Solar Observing at the Michigan Science Center
- Apr 15 – Total Eclipse
- May 10 – Astronomy Day
- May 17th – Annual Club Banquet
-

The meeting was adjourned at 7:40 pm by Vice President Art P.

FAAC Equipment Report March 15, 2014

By Dennis Salliotte

Item	Currently Held By:	Date Last Verified
Telescopes		
4" Dobsonian	George Korody	1/18/14
4 1/2" Galileo Alt/Az Reflector	James French	1/30/14
8" Orion 8XTi Dobsonian	James French	1/30/14
4" Donated Reflector in need of repair	George Korody	1/18/14
Presentation Tools		
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
Demonstration Tools		
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
Display Items		
Astronomy Event Sign (3' X 6')	Gordon Hansen	3/15/14
PVC Display Board - Folding	Dennis Salliotte	3/15/14
Banner – Large (32" X 16')	Dennis Salliotte	3/15/14
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
Other		
Sky Quality Meter	Syed Saifullah	3/15/14
Canopy (10' X 10')	Greg Ozimek	2/6/14
Equipment Etching Tool	Dennis Salliotte	3/15/14
Pop Cooler	Michael Dolsen	1/23/14

President's Article

By Tim Campbell

(continued from Page 2)

Even before the star party began, I looked up on my first evening in Florida and the first thing you notice is somebody stole Orion... it's not there. Then you look up... waaaay up. It's a bit disorienting that the difference in latitude is so large (the star party is roughly at 24.5° North latitude.) I found myself second-guessing which stars were my familiar stars as nothing is where you are used to seeing it and this includes Polaris which is much lower than you'd expect.

Once inside, our group was able to find sites to set up which were all reasonably near each other. The Star Party provides 110 AC power throughout the site, but states that this power is intended for scopes, dew heaters, and laptops only. Connecting RVs, appliances, or anything with a large power draw is not permitted. I ran my scope on battery (to avoid disruption) and only ran dew heaters and my laptop on the camp power.

The skies do not disappoint! But I confess there was a bit of initial concern. It is typically humid, so transparency is commonly not as good as it is here in Michigan (we are referring to transparency of the air itself and not to Michigan's generous supply of clouds.) As I looked up to view Jupiter, there was quite a glow surrounding the planet. I worried that the views might not be as good as I hoped. My worry would not last long.

Once the scope was aligned, I thought I'd pick a nice easy target... so it's off to

M42. I was not prepared for what I was about to see. In Michigan skies... even in dark sites such as the Great Lakes Star Gaze, I only expect a certain level of detail. The detail in the nebula was astonishing. Faint areas of nebulosity that normally require a longer exposure photo to notice were visible (obviously not all faint area, but considerably more than I can see from Michigan) but the detail was staggering and lasted from edge to edge even in my widest field low-power eyepieces. It looked like a black & white photograph of the nebula. I knew I was going to enjoy the rest of the week. Every object I inspected revealed considerably more detail than I had previously been able to see.

Seeing conditions were consistently exceptional (certainly by my standards anyway). Even on days with less ideal whether, the seeing was still extremely good. Some people mentioned it was the latitude but others indicated that it's due to the Star Party being located on a tiny island (Key) in the middle of the ocean which creates these stable conditions. Either way, one cannot complain about the results.

I had hoped to view Omega Centauri and Eta Carina. It was not to be. Eta Carina transits the meridian at about 1am at the Star Party at which time it reaches the neck-straining altitude of 5.7° above the horizon. The good news is you have a clear view to the south with nothing but 80 miles of ocean. The bad news is that unless the weather blows out the humidity, there is too much haze to see anything that close to the horizon.

President's Article

By Tim Campbell

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Dennis Salliotte did "officially" look at Omega Centauri (which at that hour is just above 90°) but confessed it was just a blurry bit of fuzz and did not have the impressive detail he has seen in the past. Omega Centauri transits at about 4:30am at which point it does reach an altitude of about 18°.

There was one personal disappointment and an important lesson learned. My LX-200 is a 14" scope and dew control is absolutely essential (don't even think about not using a dew shield at the WSP). When you consider the size of the scope and dew-shield combination, that's quite a bit of a profile to the wind. It does not take much of a breeze at all to start nudging a normally solid scope around. Imaging through that scope would not be possible without protection from wind. Jeff at AstroGizmos was there as a vendor with one of his AstroGazer portable observatory tents (the tent actually has a round hemisphere roof with shutter.. and it rotates just like a permanent dome. \$2100 for the dome and \$2400 for all the trimmings. Hmmmm. Alas Jeff only had his 7 year old demo-dome at the WSP.) No worries... I have a 4" refractor and my LX80 mount weighs only slightly less than an army tank. There's not the slightest possibility the wind is going to push that scope around even in a howling blow. It turns out the scope didn't need any help from the wind. While the LX80 mount does a fine job for visual purposes, for imaging purposes... let's just say that I've never seen star trails resemble artistically swirling Arabic characters before. If

you're into that sort of thing, I may have a mount for sale!

All in all it was a fantastic trip and I can't complain too much about the bits that didn't work as well as I had hoped. It's quite a trek to drive (Leon and I flew while George and Pat were kind enough to cart my gear in their van... Thank You George and Pat!) and not the sort of thing one can do every year. I was fortunate enough to participate this year and hope to be able to do it again at some point in the future.

Clear skies!



Lincoln Park Mi, HJRO Update

by Greg Knekleian

The Winter White Out At HJRO

Record snow drifts and cold kept HJRO closed much of December, January and February.

There wasn't much to photograph.

(I spent much of the time with another hobby, editing video that I shot last summer.)

I was able to dig my way to the observatory door one day in January, but found the door frozen shut. A brief thaw allowed me to open up the observatory door but not observe. And within a day or two more deep snow arrived. As snow falls around HJRO the parking lots are plowed.

We didn't attempt to open up the observatory to students during the day either. The massive amount of snow would cause a massive amount of tracking in of that snow for a solar event.

There was tons of snow in other observing locations as well, so many club astronomers have had an unusually long break from observing this winter.

Some FAAC astronomers went to the winter star party. I didn't have the time or budget to go to the star party so I ended up doing the next best thing. I tried to observe from inside my warm house.

I tested and practiced some "winter observing" through an open window of a small room. I observed to the east and also north east.

Rather than go into all the details here, I'm going to give a brief talk about my observing experiments during the second presentation of this months meeting. I'll be showing a slide show and try to give a short talk about this.

Obviously there are pros and cons of observing from inside a warm house, the biggest con of course is dealing with seeing problems due to heat currents.

I'll talk more about this at the presentation. For now I'm just going to mention the the types of telescopes I found more useful for my observing tests.



Lincoln Park School observatory

Parking Lot Alps?

Much of the season huge snow banks were plowed in front of the gates at HJRO.

SOME CLUES - "INDOOR" TELESCOPES

I observed from a small room through small windows. I don't want to have a huge window letting in a lot of cold air and prefer smaller windows. These impose viewing restrictions. **Small refractors and binoculars seem to work best.** **Wide field** telescopes seem to work better and "grab and go" sizes allow easy repositioning for visual observing.

A more ideal telescope would be something like a short focal length refractor, maybe a small 5 inch SCT with "visual field reducer" for lower power views. Newtonians and fancy imaging scopes that have an eyepiece up front, won't work as well. (I don't want to observe with my head next to the window opening.) Rear eyepiece setups are preferred. Open tube telescopes (Newtonians) would likely have huge problems with a heat chimney effect.

Long focal length telescopes are far from ideal. At least that seemed to be the case from my tests. I'd love to try a long focal length F15 4 inch Acro or APO refractor. But I think the F15 scope would perform poorly for this kind of observing.

(See club presentation for more info.)

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Star Stuff Newsletter
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