



What's Inside...

[Solar Observing Continues](#) Pg 2

[Murmurs of Earth From Durango](#) Pg 3

[Billion vs Trillion](#) Pg 5

[History of Astronomy III](#) Pg 6

[General Membership Meeting](#) Pg 9

[Letter From the President](#) Pg 10

[Good News for Red Dwarf Planets](#) Pg 11

[Contacts](#) Pg 12

[Photo Gallery](#) Pg 13

Note: Use bookmark panel in Adobe Reader.

BACK TO IN-PERSON MONTHLY MEETINGS

By Mary Ducca

I hope this issue of the Asterism continues to find everyone safe and well. Yes, it has been a long 18 months since we were last at Sperry Observatory, but the weekly Fridays@Home presentations have been working out well. And we have been able to stream live most of the presentations on AAI's Facebook page. If you missed any of them, they are still there. And you can find the list of the upcoming presentations on the AAI website at www.asterism.org. Click on Events and then scroll down to Fridays@Sperry for the list. The presentations are also posted on the AAI Facebook page, [Amateur Astronomers, Inc.](#) each month. Thanks to all who have been participating when they can on Friday nights to listen to members of AAI and the monthly speakers giving presentations on Astronomy related topics. And joining in for the "social hour" afterward helps us stay connected with one another. Discussions during the social hour have included such topics as a continuation of the presenter's talk and what SpaceX or Blue Origin launches has anyone seen, while others have been the usual "what did you do this past week".

Most, if not all of you, have been wondering and asking what are the plans to return to the in-person monthly meetings and the weekly Friday nights at Sperry Observatory in the future? Union County College is starting to open up the campus. We submitted the dates we would like to have for our in-person monthly meetings. We have since received approval from UCC to have the monthly meetings on September 17, October 15, November 19 and December 17, 2021 in the Roy Smith Theatre from 8:00 pm – 10:00 pm. Note that we have not yet received approval for the January through May, 2022 monthly meetings. It may be that the College will want to see how things progress over the next several months with the pandemic and the variant that is currently present before deciding what they will do for 2022. So, stay tuned.

In the meantime, securing speakers for the monthly meetings is continuing with almost all of the months scheduled as of this writing. As a reminder, the May meeting is for members of AAI to give short presentations on research and/or imaging they have done in the past year.

One of the bonuses during this past year was taking advantage of listening to presentations given online by various other institutions and organizations. That gave me ideas for requesting some speakers for our monthly meetings. I also received suggestions from members of AAI for potential speakers. My thanks to those who gave suggestions.

Our speaker for the September 17, 2021 General Membership meeting is Mr. Robert (Bob) Naeye who is a freelance science journalist. He is a former editor-in-chief of Sky & Telescope magazine. He also worked for NASA at its Goddard Space Flight Center in Maryland. Over his 30-year career he has written hundreds of articles on astronomy and space science. He has authored two books and contributed to three more. I hope you will join us in September for our first monthly in-person meeting!

As for getting into Sperry Observatory, well, that is still in question. Jim Nordhausen was given permission to get into the Observatory a few Friday nights in July to check on the equipment and do some needed cleaning. He also obtained the solar telescopes for outreach opportunities being held this summer. While there he was able to run the 24 inch telescope. After the presentations were over, by utilizing Zoom he showed some of the night sky objects. We got to see the Moon and the globular clusters M3 in the constellation Canes Venatici, M5 in the Constellation Serpens, and M13 and M92 both in the constellation Hercules. It was great to be able to see them from the 24 inch telescope! Clif Ashcraft also showed the night sky from his observatory in Perrineville, NJ during some Friday nights. And some members have also shown us images they have taken of the Moon, planets, clusters and nebulae. Thank you to Jim, Clif and others for letting us see live observing of the night sky! Subsequently, Jim has been granted permission from UCC for a two person crew to enter Sperry on Friday evenings for the foreseeable future for remote observing. Consequently, on the Fridays@Home, after the presentation, live observing through the 24 inch telescope will be held, weather permitting.

We will have to wait and see if/when we get approval from UCC for use of the Observatory again by the members and the public. Whenever we hear if we are able to get back into the Observatory, the general membership will be notified. In the meantime, continue to stay safe and keep your fingers crossed that we will eventually be able to return to meeting weekly at Sperry Observatory.

And wishing everyone clear skies!



SOLAR OBSERVING CONTINUES

By Mary Ducca

Calling all volunteers! Do you like sunny Saturdays in the summer and early fall? Do you enjoy observing the Sun safely through AAI's safe solar equipment? If so this may be the opportunity that you could participate in this year.

Let me explain. Last year due to the pandemic we had to cancel all solar observing at Trailside Nature and Science Center located in Mountainside, NJ. Solar observing is a weekly outreach program

that AAI member Ray Shapp started in 2011. Bob Ruggiero then took it over in 2013. Bob ran the program every Saturday from April through late September/early October from 1:00 pm – 2:00 pm, weather permitting. This allowed the public to safely observe the Sun with our solar equipment. The public could see prominences and sunspots on the Sun. And it was a great way to connect with the public, teaching them about the Sun, and also to promote AAI.

This year we had not heard yet about a reopening of Trailside so Bob contacted the Turtle Back Zoo to see if they could accommodate us. The response was a resounding yes! They requested that we come once a month for 4 hours on a Saturday from July to October. Given the number of people that come through the Zoo on a Saturday, it could number close to a thousand, being there for 4 hours would help to accommodate all who would want to observe the Sun. The dates that they requested us to be there are July 31, August 28, September 25 and October 16 from noon to 4:00 pm. Now that Bob has the solar equipment from Sperry Observatory, solar observing can resume.

Subsequent to agreeing to do solar observing at the Turtle Back Zoo, Bob learned that Trailside reopened to the public on July 1. They would like us to come back and do solar observing there on Saturdays. That runs from 1:00 – 2:00 pm, weather permitting. So now we have two places where we can safely observe the Sun with the public - the Turtle Back Zoo on the 4 dates listed in the prior paragraph and Trailside on the Saturdays when we are not at the Turtle Back Zoo, weather permitting.

Consequently, Bob is requesting help from members of AAI to assist him with the observing. This would include setting up and operating the equipment (very easy to do I may add), keeping the public in line and talking to the public about the Sun and also about AAI. The equipment consists of a solar telescope from which you can observe prominences from the Sun and a sunspotter with which you can see sunspots on the surface of the Sun. In addition, there is a display showing the light spectrum of the Sun. All equipment is light and portable. Bob can give you easy instructions to follow about operating the solar equipment. He can also give you information about the Sun which you can in turn communicate to the public, along with talking about AAI. If you have a lawn chair bring that too. Bob will also be attending on Saturdays – also weather permitting.

If you can spare a Saturday to help out, please contact Bob via e-mail at bob55rugg@gmail.com . All observing is done outside so dress appropriately. This will also be a great way to meet up with other members of AAI and catch up.

Remember that Astronomy is looking up! And for solar observing, wishing everyone sunny skies!



MURMURS OF EARTH FROM DURANGO

By Bonnie B. Witzgall

Whether people realize it or not, we are all astronomers. Regardless of one's education, budget, or social pursuits, there is an enigmatic desire to look at the night sky and sense its wonder. One just never knows when there will be a chance encounter with a kindred spirit.

Months ago, I had an enjoyable encounter with such a 'closet' astronomer at my job. I work in the accounts receivable department for a large retail chain store. Monitoring each day's receipt, reviewing

our bank income posting, and confirming each credit card sale is hardly a task where people get to share astronomical narratives. Upon occasion, there is a problem with a credit card purchase and so I seek outside help.

My company works with WorldPay, a business that makes sure every swipe of your credit card moves smoothly from the shopper's account into the proper retailer's bank. If an issue arises, I call the Customer Service area of WorldPay and speak with whoever is available on their HelpDesk. During one of these inquiry calls, I hit pay dirt.

Brent S. answered the WorldPay phone and helped me with my credit card question. He is the first person on HelpDesk duty 7AM Mountain Standard Time located in Durango, CO. Since I gather all my questions and call around 9AM EST, he and I connect often and have time to chat. Once Brent gave me the data I needed for some errant credit cards, I told him that my husband and I knew a mineral merchant from Durango who also deals in meteorites.

"Really?" came Brent's reply, "Is his name Blain?"

"Yes! I can't believe you know Blain." I was so shocked and surprised we knew this same mineral dealer. Brent explained that he is 'into' native Colorado minerals, but he always had an interest in meteorites and astronomy. I described that my husband and I are members of several astronomy clubs, help teach basic astronomy to public visitors and help administer an observatory on the campus of a county college in New Jersey. COVID or not, I could not help but brag about AAI's accomplishments.

Brent then says, "Do you know what I did last weekend?" Before I could guess an answer, he said, "I went out and bought all the DVDs of Cosmos, the TV series."

Ah, but I just had to ask, "Brent, was it the 'old' Cosmos or the newer Cosmos?"

"Of course it is the old one, the good one with Carl Sagan. I don't like....what's-his-name?"

"Neil deGrasse Tyson." I answered.

"Yeah, yeah, that's him. He's a loser. I love Professor Carl Sagan."

"Oh, Brent, I do, too!"

We continued to talk about general astronomy, the not so clear night skies in my New York Metro area and the 2020 Grand Conjunction of Saturn and Jupiter on the Winter Solstice. Since we both had earthly desk jobs to perform, I thanked him for his help and we ended the conversation.

Now I deliberately call the WorldPay HelpDesk at the same time every day or email Brent directly with my credit card queries. We have also exchanged photos of the Grand Conjunction and discussed the trials of teaching astronomy via Zoom. I must tell you it is a pleasant point in time to mix work with pleasure. It is so refreshing spending a few minutes with a kindred spirit and a Sagan devotee.



Note: Opinions expressed by the author and the customer service rep are not necessarily those of AAI.

DIFFERENCE BETWEEN A BILLION AND A TRILLION

Contributed by Rob Sobel

A cubic meter contains a billion cubic millimeters.

And a trillion is approximately 30,000 years of seconds.

So counting one second at a time, it would take approximately
30,000 years to get to a trillion.

Interested in Serving on an AAI Committee?

AAI's Committees can be found on our website at www.asterism.org. The Club is organized into a number of interest and service committees, supporting all areas of astronomy and public relations. We are always looking for volunteers. On the Home Page click on About and scroll down to Committees. Click on a committee or activity name to see a description of its functions and its chair or principal member. If you would like to help, contact the listed member. In most cases, you can simply click on his or her name to email them. This is a great way to meet members of AAI and make new friends!

New Members

Amateur Astronomers, Inc. welcomes the new members to our club since JAN 2021:

Robert Sobel

Jeffrey Zhou

We hope you enjoy using Sperry Observatory and all the opportunities available to you as a member such as seminars, lectures, training, observing, and research. Our Qualified Observer course is a great place to start. Equivalent to a college-level introduction to Astronomy, it includes hands-on training on our 24-inch reflecting telescope. Check out our website to see all the opportunities.

Again, welcome to AAI! Irene Greenstein, Membership Chair



HISTORY OF ASTRONOMY III

By Alberto Guzman



Before moving to our next Greek astronomer, we should travel back in time to the astronomical forebears of the Greeks.

The Babylonians

Mesopotamia (from Greek words meaning “land between the waters,” and roughly modern Iraq) was always subject to invasion. It is not surprising, then, that numerous civilizations conquered the area and were conquered in turn. There have been important cities there for perhaps 8000 years. Babylon (roughly Baghdad) was one, and it was capital for the civilization that dominated approximately 1900 to 700 BCE.

Astronomy

The Babylonians had a striking record in astronomy, particularly in tracking the Sun. Their observations led to antiquity’s best estimate of the length of the year and to mapping the stars.

As Earth orbits the Sun, it appears to us that the Sun goes around the sky over the course of the year. Sun’s path through the starry background is a great circle called the “ecliptic.” No doubt viewing it as the path of life, the Babylonians organized the star groups along it into [let us say creative] representations of living creatures. The resulting constellations include such real beings as a lion and a scorpion, and such mythical ones as a “sea goat.” That menagerie of creatures is known to us all, its name derived from Greek: “Zodiac,” from the word for “life.” [Think of “zoology.”]

It would be a staggering coincidence if our planet’s axis of rotation pointed at right angles to the plane of the ecliptic. In that case, the projection of Earth’s equator onto the sky would coincide with the ecliptic; the Sun would travel along the “Celestial Equator.” Instead, the axis now points 66.6° off that plane—in other words, inclined at the complimentary 23.4° down from perpendicular. Accordingly, the Equator and ecliptic are great circles with a 23.4° angle between their planes. Their two intersections are called the “equinoxes,” from the Latin for “equal nights.” (See the [details page](#) about that.) One intersection (the “vernal” or “spring” equinox) is now in Pisces. In our calendar, the Sun gets there around March 21. The other (“fall” or “autumnal” equinox) is now in Virgo, the Sun hitting it around September 21.

The Babylonians measured the year by counting the days between spring equinoxes hundreds of years apart. Their estimate amounted to 365.2425 days. Notice that the number is short of $365.2500 = 365\frac{1}{4}$.

Having a location for the vernal equinox, they then mapped the sky by measuring stars’ angular distance eastward (corresponding to modern “ecliptic longitude”) from the vernal equinox and angular distance above or below the ecliptic (“ecliptic latitude”).

Numeration

That “365.2425” uses our “decimal place-value system.” Place-value numeration was a Babylonian innovation. However, it was “sexagesimal,” based on 60 instead of 10. Decimal numeration uses powers of “base” 10. Thus: 365.2425 means

$$3 \times (10^2) + 6 \times (10^1) + 5 \times (1) + 2 \times (10^{-1}) + 4 \times (10^{-2}) + 2 \times (10^{-3}) + 5 \times (10^{-4}).$$

(See the [details](#) about those powers.) The same number in sexagesimal would be
[six] [five] [fourteen] [thirty-three],

meaning $6 \times (60^1) + 5 \times (1) + 14 \times (60^{-1}) + 33 \times (60^{-2})$.

(That’s $360 + 5 + 14/60 + 33/3600$ in American money. Check that it adds up to exactly 365.2425. The reason for writing *words*, like “thirty-three,” is that the Babylonians would have used some sort of aggregates to represent our “33.” See the [details](#).)

If you find those fractions and the decimal to be a mysterious estimate of the year, consider that they give exactly the length of our calendar year. Julius Caesar decreed that the calendar should have an added day (total of 366 days) every fourth year. That set the year at $365\frac{1}{4}$ days. Sixteen centuries later, Pope Gregory XIII adopted the suggestion of Luigi Lilio (or “Giglio” or Latin “Aloysius Lilius”) to skip three added days every 400 years—in particular, to make the skips in the century years not divisible by 400. (In English: 1600 was a leap year, but not 1700, 1800, or 1900; 2000 was a leap year, but 2100, 2200, 2300 will not be; 2400 will be) In different words, the Gregorian calendar adds 97, not 100, days every 400 years. Its year is $365+97/400$ days long. Check that Lilio, by design or by accident, matched our year to the Babylonian estimate.

Hipparchus

Hipparchus was born around 190 BCE, near the death of Eratosthenes. He is in different contexts called “the father of astronomy” and “the father of trigonometry.” He did noteworthy analysis of solar, lunar, and planetary motions, refining and extending results of the Babylonians, including the estimate of the year.

Angle measure

Ancient geometers (including Aristarchus and Eratosthenes, going even past 1000 CE) measured angles in terms of chords. In Figure 1, focus on the angle AOB, whose (red) sides intersect a circle (green) centered at its vertex O. Segment AB (black) is a “chord” of the circle. The ratio between chord and radius—in a bigger circle, the chord would be bigger, but in proportion to the radius—measures the angle.

The Babylonians used as standard a chord with length equal to the radius. That chord spans $1/6$ of the circle (see why in the [details](#)). Also they subdivided it into, naturally, sixty equal pieces. In Figure 1, we see u, v, and w, three of the 59 points inserted to make the subdivision and allow finer measures.

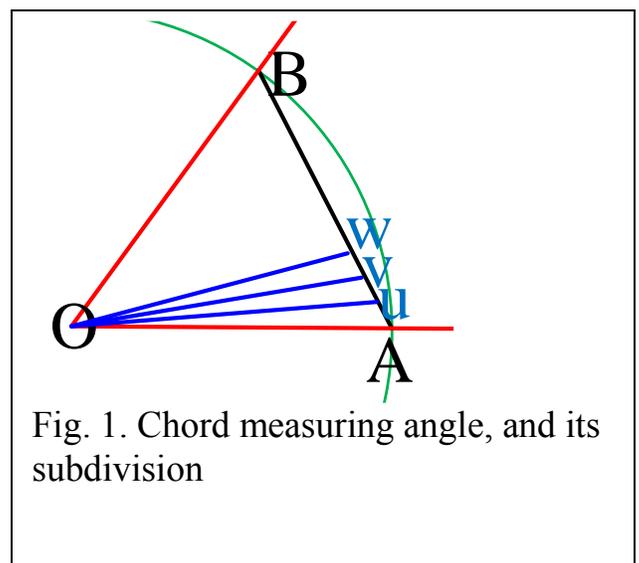


Fig. 1. Chord measuring angle, and its subdivision

Now, dividing the *chord* into equal pieces does not divide angle AOB into equal *angles*. The angles AOu, uOv, vOw, and so on (blue sides) get bigger toward the midpoint of the chord, then symmetrically smaller toward B ([details](#)).

Hipparchus introduced a measure that the ancient world had never used. He divided the *arc* AB into 60 equal parts, or “degrees.” Since AB spans 1/6 of the circle, that divided the circle into 360 equal parts. (Or maybe it was the other way around: He could have divided the circle into 360 parts. Doing that would make the Sun’s travel about one degree per day. That choice is also convenient; unlike 365, the number 360 has many divisors.)

Precession

Among the angles Hipparchus measured were angles in the sky. Hipparchus revisited the Babylonian coordinates. He found that the stars had moved toward the east. In fact, it seemed that the entire dome of heaven had rotated eastward. He correctly ascribed the change to the reference point’s moving: *The equinox had moved to the west*. His measurements allowed him to quantify the “precession of the equinoxes.”

Earth’s rotation axis is not stable. Instead, it undergoes “precession,” the sort of wobble a top or toy gyroscope shows as it slows down. (Go to [Wikipedia®](#) for a great animation of precession.) The extension of the axis traces a circle in the sky over a period of around 26,000 years. Since the axis is thus dancing, the Celestial Equator turns with it (and the axis inclination changes and the Tropics move). Therefore its intersections with the ecliptic, the equinoxes, slide westward (as Aristarchus suspected). In early Babylonian times, the spring equinox was in the constellation Taurus. That put the start of spring and the long days in what we would call May. In our era, that equinox is two constellations to the west, in Pisces. Accordingly, our spring starts in March.

A result of Hipparchus’s discovery was the realization that there are two “years.” One description of the year is the duration of Sun’s trip around the starry dome (in other words, one Earth revolution around the Sun). That is now called the “sidereal” year (year of the stars), calculated at 365.2563+ days. We also describe a year as the length of the cycle of the seasons. That would be Sun’s trip from one spring equinox to the next. It is called the “tropical” year. The latter is shorter, calculated as 365.2422- days. As the Sun travels eastward from this year’s spring equinox toward next year’s, the equinox moves westward to meet it. The movement is about 1/72 of a degree (now; Hipparchus estimated it to be 1/100 degree). Therefore the tropical year is short of a sidereal year by about a 1/72 of a day. (How long is that?) Look again at that tropical length: Our year—the Babylonian year—is too long by 3 days every 10,000 years.

Next

The last of the ancient astronomers built on the ideas of Hipparchus. We meet him next, along with the refinement that guided astronomy for fourteen centuries.



Next GENERAL MEMBERSHIP MEETING: SEPTEMBER 17, 2021

ROY SMITH THEATER – UCC CAMPUS

8:00 PM



The Search For Life On Other Worlds

Robert Naeye

Freelance Science Journalist

Hershey, PA

Are we alone or do we share our solar system and galaxy with other forms of life? And how widespread are advanced civilizations with whom we could communicate?

Right now we don't have answers to these profound questions. But scientists are in hot pursuit. The technology of searching for life on other worlds has reached a level of maturity where the first definitive evidence of extraterrestrial life could come in the very near future.

During a September 17 online presentation, science journalist Robert Naeye will explore three different roads for detecting life beyond Earth:

1. Launching robotic spacecraft to discover life on Mars or other worlds in our solar system.
2. Deploying large telescopes to detect the chemical signatures of life in the atmospheres of planets orbiting other stars.
3. Using various techniques to pick up signals from advanced civilizations or to find evidence of their technological activities.

Robert's talk will be loosely based on a cover story he wrote for the September 2020 issue of Astronomy magazine. His talk will be nontechnical and intended for a general audience.

Robert Naeye is a freelance science journalist based in Hershey, Pennsylvania. He is a former editor in chief of Sky & Telescope, the world's most respected popular astronomy magazine. He also worked for NASA at its Goddard Space Flight Center in Maryland. During his 30-year career he has written hundreds of articles about astronomy and space science. He has authored two books and contributed to three others. Please visit his website at www.robertnaeye.com.

Letter From the President



To the members of AAI,

I hope this letter finds you safe and healthy in what has been a difficult time. Due to the worsening pandemic we must still keep Sperry Observatory closed to both the public and our members for the foreseeable future. We will of course reopen as soon as UCC gives us the green light and conditions are safe enough for us to do so responsibly. This hasn't stopped our programs from continuing. We still hold lectures weekly every Friday night at 8:00 PM online via Zoom. You all should be receiving the links in your email each week. Our Vice-President Mary Ducca has once again in struggling times put together an excellent lineup of speakers for our Main Lecture Series which are so far scheduled to be in-person in the Roy Smith Theatre.

As always, if any member has any thoughts and ideas or wants to become more involved in what activities the club is currently doing, please don't hesitate to communicate. I can be reached at President@Asterism.org

Clear Skies

Aaron Zuckerman
President

Amateur Astronomers, Inc



GOOD NEWS FOR RED DWARF PLANETS:

Their Chance To Support Life Just Went Up

By Kathy Wydner Kawalec

This is from the “in case you hadn’t heard” category ...

Red dwarf stars are the most common kind of stars in our galaxy, and many have been found to have rocky, terrestrial planets, even multiple planets in planetary systems. Because red dwarf stars are low in mass, surface temperature, and luminosity, their planets must orbit them closely in order to lie in their star’s habitable zones. In fact, numerous red dwarfs have been found to have exoplanets that are close enough to lie in their habitable zones, where water is proposed to exist in liquid form on planetary surfaces. Since life “as we know it” needs liquid water, astrobiologists who search for life on worlds beyond earth are encouraged by the potential for liquid water.

Because habitable planets need to orbit dwarf stars closely, most are expected to be “tidally locked”, with the same side of the planet always facing the star and the other side in darkness. As long as a planet has an atmosphere, this resulting temperature difference could be lessened by the transfer of heat from one side of the planet to the other. Red dwarf stars have been determined to be very long-lived, with estimated life spans in the range of 20 to 600 billion years, giving life plenty of time to develop and evolve.

However, it has also been found that these small, fast-rotating dwarf stars emit “superflares” that have dire consequences for potential life on their planets: intense radiation that would sterilize life and even rip away planetary atmospheres!

A new peer-reviewed paper just published in the *Monthly Notices of the Royal Astronomical Society* on August 5, 2021 reports some encouraging news: Planets orbiting red dwarf stars could still be habitable because the intense flares are erupting from near the poles of the stars and are not directed toward the plane along which most planets would likely orbit. The international team of astronomers, led by Ekaterina Ilin, used data from NASA’s Transiting Exoplanet Survey Satellite (TESS). As long as the planets orbit in the same equatorial plane of their star as the planets in our solar system do, the worst flares would be directed upwards or downwards out of the planetary system. These results, which showed that giant flares only occurred near stellar poles, were based on only four red dwarfs that were suitable for the researchers’ new observation methods; however the chances of consistent results from these four randomly selected stars *not* being representative is about one in a thousand. Therefore, this finding is likely a common feature of red dwarf stars.

For more information, below is a link to the abstract of the original paper:

Ekaterina Ilin, Katja Poppenhaeger, Sarah J Schmidt, Silva P Järvinen, Elisabeth R Newton, Julián D Alvarado-Gómez, J Sebastian Pineda, James R A Davenport, Mahmoudreza Oshagh, Ilya Ilyin, Giant white-light flares on fully convective stars occur at high latitudes, *Monthly Notices of the Royal Astronomical Society*, 2021; stab2159, <https://doi.org/10.1093/mnras/stab2159>

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Kathy Wydner Kawalec, Editor

Deadline for submissions to the newsletter is ~ two weeks prior to its next publication.

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Technical Committee

MEMBERSHIP DUES

Regular Membership:	\$25
Sustaining Membership:	\$40
Sponsoring Membership:	\$55
Family (12 Years Old and Up):	\$10
Youth (Under 12 Years of Age):	\$5
<i>Sky & Telescope</i> :	\$32.95
<i>Astronomy</i> subscription:	\$34

(Subscription renewals to *Sky & Telescope* and *Astronomy* can be done directly by AAI members. See "Membership-Dues" on website for details.)

AAI Dues can be paid in person to our Membership Chair, or by mail to: AAI, PO Box 111, Garwood, NJ 07027-0111

DOME DUTY

TBA	Team A
TBA	Team B
TBA	Team C
TBA	Team D
TBA	Team E

FRIDAYS@HOME

Online 8:00–9:00 PM

August 20, 2021

The Cosmic Web

Dr. John Sichel

August 27, 2021

Observing Dr. Clif Ashcraft

September 3, 2021

What's Up: A Down to Earth

Sky Guide Kathy Vaccari

All schedules above were accurate at time of publication. Please check www.asterism.org for latest information

General Membership Meetings are held the **third Friday** of each month from September to May.

On **October 15, 2021**

Dr. Rachael Beaton
of **Princeton University**

will present:

**The Constant Hubble Wars:
21st Century Edition**

RESERVATIONS TO ATTEND THE SATURDAY NIGHT PROGRAMS AT JENNY JUMP STATE PARK IN HOPE, NJ, ARE REQUIRED

Go to UACNJ.ORG and click on "our reservation page" to make a reservation.

Photo Gallery: Annular Eclipse, Orion Nebula, Jupiter, and Galaxies

Partial Annular Eclipse of June 10, 2021. Wayne Zuhl captured the following three photos; two are unfiltered shots, and one was taken with a solar filter. The images were taken at Sandy Hook with a Canon 60D and a 200 mm lens.

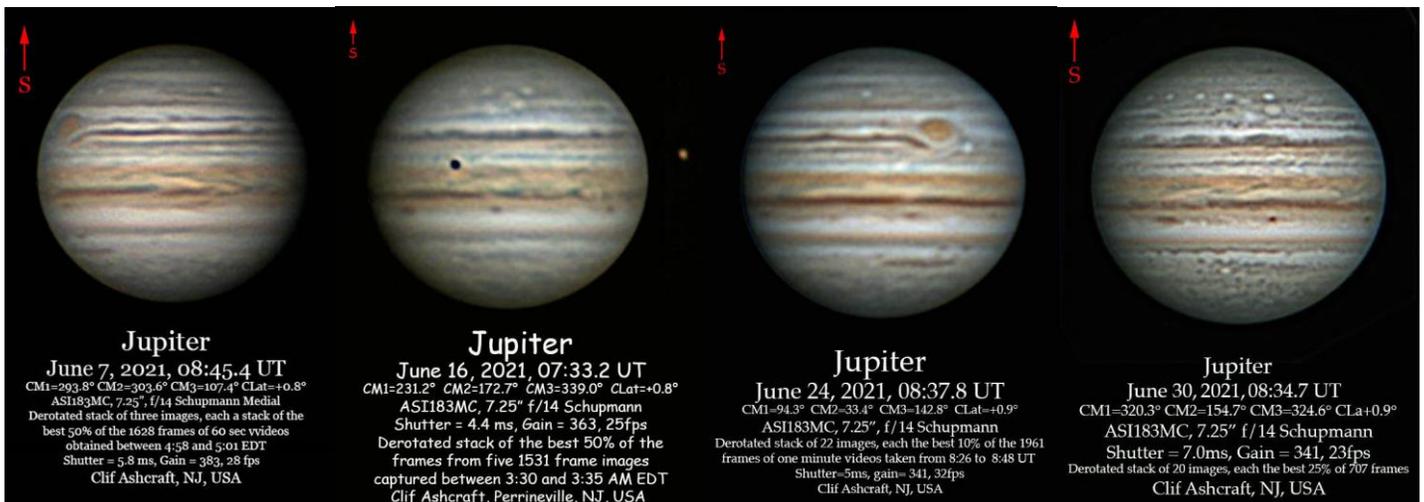




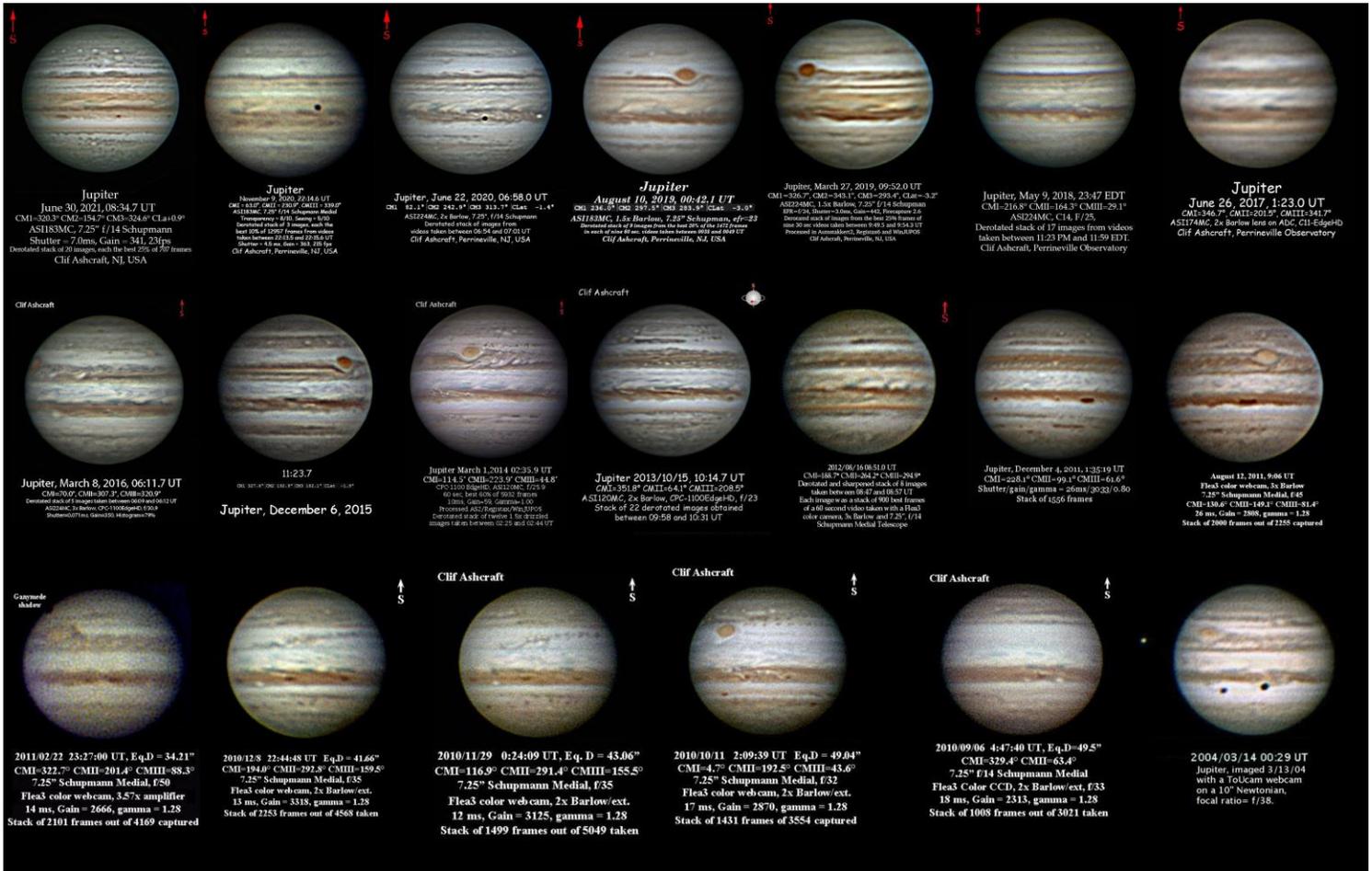
The Orion Nebula. Wayne Zuhl contributed this guided stack of images of the Orion Nebula taken with a Canon 60D and 200 mm lens and an L-Enhance Filter from his home in Livingston, NJ.



Recent Jupiter Images by Clif Ashcraft – June 2021



Jupiter Montage by Clif Ashcraft – 2004 to Present



The Milky Way As Seen From West Texas – Clif Ashcraft



M31, The Andromeda Galaxy, from Clif Ashcraft's Observatory in New Jersey



M31, The Andromeda Galaxy. 912 second live stack of 8 sec exposures. 72mm f/6 AstroTech Semi-APO

M81 – In the Local Group along with the Milky Way and Andromeda Galaxy



M81, Bode's Galaxy, 12 million light years away
SmartCap Live Stack of 132 frames, 22 minutes total exposure
ASI294MC, 0.63x focal reducer, C14, efr = f/7
Clif Ashcraft, NJ, USA

M82 – Also in the Local Group



From the Canes I group, a galaxy with no dark matter and one with two disks of stars, rotating in opposite directions (Clif Ashcraft):

M94, 16 million light years away



M64, 17 million light years away.



M101, 20 million light years away.



M101

Spiral Galaxy in Ursa Major
21 million light years
C14, 0.63x reducer, ASI294MC, Clif Ashcraft

In the Canes II group, 24 million light years away we have the Seyfert Galaxy
M106



M106, A Type 2 Seyfert Galaxy in Ursa Major. 24 million light years away.
C14, 0.63x focal reducer, ASI294MC, SmartCap LiveStacking, 480 sec. Cliff Ashcraft

A real beauty, M51 is colliding with a smaller barred spiral galaxy,
NGC 5195, and is 23 million light years away



M51, The Whirlpool Galaxy

Calibrated LiveStack of 90 ten second exposures, SmartCap
ASI294MC, 0.53x Starizona focal reducer, C14, 2x binning effective focal ratio $\sim f/3.5$
Clif Ashcraft, NJ, USA

Here, in the Coma Bernices group of Galaxies is NGC 4565, the Needle galaxy, 30 million light years away along with two other members of that cluster



M87 from the Virgo cluster of galaxies. It has a huge black hole in the center that was recently imaged by the Event Horizon Telescope, an array of radio telescopes with an aperture nearly the diameter of the earth. My picture was obtained by Lucky Imaging and shows the relativistic jet of plasma emitted from the accretion disk of the black hole. The jet has a velocity 99.9% of the speed of light. M87 is 53 million light years away.



Finally, 85 million light years away in the Ursa Major Cloud of galaxies we have M109, a barred spiral very much like the Milky Way, but a bit bigger. When the light that formed this image left on its journey to my camera, T. Rex was just coming into his own on our planet.



Note: Clif did a calculation using data from Memory Alpha (Trekkers go there) and figured out that Captain Kirk's Enterprise, running full blast at Warp Factor 9.2 would take 49,000 years to get to M109.

