June 2004 **Volume 6**

The Night Sky

A Publication of The Astronomy Club of Akron
Akron, OH USA
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2004 ACA Calendar	Summary
6/12/04 Sat 9:00 p.m.	The Planet Jupiter—ACA Observatory
6/19/04 Sat	CVAS OTAA convention
6/26/04 Sat 7:30 p.m.	15th Annual Telescope Seminar—ACA Observatory
7/10/04 Sat 9:00 p.m.	The Jewels of Summer—ACA Observatory
7/17/04 Sat 4:00 p.m.	CAA OTAA convention—Letha House
7/24/04 Sat 9:00 p.m.	The Summer Constellations—ACA Observatory
8/7/04 Sat 9:00 p.m.	The Autumn Constellations—ACA Observatory
8/14/04 Sat	MVAS OTAA convention
8/21/04 Sat 6:00 p.m.	Solar/Lunar/Hot Dog Roast—ACA Observatory
9/11/04 Sat 7:30 p.m.	The Planets Uranus & Neptune– ACA Observatory
9/18/04	Black River OTAA convention
9/24/04 Fri 8:00 p.m.	ACA General Membership Meeting— Kiwanis Club
10/16/04 Sat 7:30 p.m.	ACA Observatory Open House— ACA Observatory
10/22/04 Fri 8:00 p.m.	ACA General Membership Meeting—Kiwanis Club
11/6/04 Sat 7:30 p.m.	ACA Observatory Open House—ACA Observatory
12/11/04 Sat 7:30 p.m.	ACA Observatory Open House—ACAObservatory

2004 ACA Calendar-Detail

Friday, June 11
Camp C.H.O.M.P.S. at Camp Christopher. Members are needed to set up scopes from 9-11, weather permitting. Camp Christopher is located at the corner of Ira and Hametown Roads.

Saturday, June 12
ACA program at the observatory beginning at 9:00 p.m. Gregg Crenshaw will give the talk and slide show on Jupiter. Please bring your telescopes for a last chance to see the colorful bands of the gas giant which sets at 1:27 a.m.

Saturday, June 19
Camp Wonderlung at Camp Christopher. Members are needed to set up scopes from 9 –11, weather permitting. Camp Christopher is located at the corner of Ira and Hametown Roads.

Saturday, June 26
Fifteenth annual telescope seminar at the observatory. The program begins at 7:30 p.m. Please bring your telescopes and binoculars for the public star party which will follow the talk. We still need speakers to speak on binoculars and reflectors. If you are interested, please see Ray Paul.

Saturday, July 10
ACA program at the observatory on "The Jewels of Summer." The program begins at 9:00 p.m. and focuses on the Ring Nebula, the Dumbbell Nebula, the Hercules cluster, the Andromeda Galaxy and many others. Please bring your telescopes for the public star party which follows the program.

Saturday, July 24
ACA program at the observatory beginning at 9:00 p.m. The program will be on the Summer constellations: Hercules, Lyra, Ophiucus, Sagittarius, Scorpius and others. Please bring your telescopes for the public star party which follows the talk.

Sky Events for June 2004

June 9 **Last Quarter Moon** at 20:03 UT.

June 15 **Moon near the Pleiades** at 14h UT (morning sky).

June 16 **Moon near Venus** at 15h UT (only 13° from Sun, morning sky).

June 17 **Moon at apogee** (furthest from Earth) at 16h UT (distance 406,575 km; angular size 29.4').

June 17 **New Moon** at 20:27 UT. Beginning of lunation 1008.

June 18 **Mercury at superior conjunction** at 21h UT (not visible). The planet passes into the evening sky.

June 19 **Moon near Saturn** at 7h UT (16° from Sun, evening sky).

June 20 **Moon near Mars** at 11h UT (evening sky).

June 21 **June solstice** at 0:57 UT. The time when the Sun reaches the point farthest north of the celestial equator marking the start of summer in the Northern Hemisphere and winter in the Southern Hemisphere.

June 24 **Moon near Jupiter** at 2h UT (evening sky).

June 25 **First Quarter Moon** at 19:08 UT.

All times Universal Time (UT). (USA Eastern Summer Time = UT - 4 hours)

Upcoming Astronomy Events

June 11 and June 12
Apollo Rendezvous &Telescope Fair
Dayton, Ohio
http://www.mvas.org

June 14 thru June 20
Laurel Highlands Star Cruise
Hazelton, West Virginia
http://www.lhstarcruise.org
July 8 thru July 11
Green Bank Star Quest
Green Bank, West Virginia.
www.caacwv.org or www.KVAS.org

August 17 thru August 22
AstroBlast 2004
Oil City, Pennsylvania
http://www.oras.org

Board Meeting Minutes May 16, 2004

An ACA board meeting was held on May 16th at 2:00 p.m. In attendance were David Jessie, John Crilly, Gary Smith, Pete Flohr, Rosalena Villasenor, Ray Paul, Lynn Laux, and Tom Mino.
1. New Business: A vote was held for a New Trustee and Jim Anderson was unanimously voted in. Welcome Jim.
2. A lengthy discussion was held on how to best set up the ACA's web page to be more user friendly when downloading The Night Sky. This will be continued.
3. Dues for the 2005 year are going up to $25.00 for those who receive The Night Sky via E-mail, and $30.00 to those who would like the newsletter delivered by the postal service. Vote will be brought before the membership at the next meeting
4. Ray is going to talk to the park services about replacing the old picnic tables for new ones. In the meantime, he will move the tables under the observatory out into the field and put the new ones under the canopy.
5. All the future telescope borrowers must ok the use with the observatory director (Ray Paul) and sign them out and back in. Ray will come up with a sign out sheet.
6. A discussion was held on the possibility of an outreach panel to field calls from groups that may wish to have a speaker or have a demonstration at the ACA. Such a panel would need to set up times and dates of meetings and return and answer phone calls about personnel available for meetings.
7. The Focus Committee is still intact.
8. The ACA is in need of speakers on Saturday June 26th for the telescope seminar to speak on binoculars and reflectors for approximately 15-20 minutes. Please see Ray Paul.
9. We are in need to up grade the membership roster, possibly adding e-mail addresses and phone numbers.
10. Meeting adjourned at 5:15. Kind regards;

Pete Flohr

Treasurer's Report: May 2004

Total Beginning Assets	**$3931.23**
Income	
Dues and Misc.	$1711.30
Interest	$0.98
Expenses	
ACA Newsletter	$115.79
Observatory	$290.87
Subscriptions	$156.85
Total Ending Assets	**$5080.00**

Submitted 5 - 28- 2004 Gary Smith

Secretary's Minutes May 28, 2004

1. The meeting started at 8:10pm
2. Clyde Simpson spoke about the Cleveland Museum of Natural History. He discussed the many contributions the Cleveland area has made to astronomy and space travel.
3. Business meeting started at 9:15
4. We are in need of a new merchandise sales person.
5. Focus group had no news at the time. Group will be meeting soon.
6. June 11th, Friday, Camp C.H.O.P.S. will need volunteers to set up telescopes [at Camp Christopher] from 9-11 p.m.
7. Camp Wonderlung will meet [set up scopes at Camp Christopher] June 19th.
8. Carl and Betty Hervol have volunteered their home for the ACA annual picnic July 18th. The club will supply a meat tray [hamburgs, hotdogs and buns] and members will bring a covered dish, place setting(s), and chairs.
9. June 8th the ACA will set up telescopes at the Portage Lakes State Park Beach to see the Venus transit at 6:00 a.m.

Peter Flohr

Vice President's Corner

This should be a fun year for the Club. I look forward to participating in many of projected Club activities. I particularly enjoy getting out to public viewing sessions and seeing all the different gear being used.

This is because I'm more of a gearhead than a serious observer. I like the hardware; I love trying out different telescopes, mounts, eyepieces, and ancillary equipment. I've owned or used a broad variety of the popular setups and I'm always glad to try to help out with equipment questions. Please feel free to approach me for assistance if something doesn't seem to be working the way you thought it would.

Remember we have another Club resource for general discussion, questions and tech support: the Yahoo discussion Group at:
http://groups.yahoo.com/group/astronomyclubofakron/

I tend to change gear during the winter, so every Spring I have different

gear to figure out and try. I've been primarily an SCT user, but my current arsenal has swung toward reflectors. I'll be dragging an assortment of Dobsonians to the Club site this year. My main instrument will be a 15" F/5 Star Splitter truss Dob which I am in the process of equipping with a Dob Driver II for automatic tracking and goto. On more ambitious occasions I'll be bringing out a vintage 20" F/4 Sky Designs truss Dob (this one's a heavy bugger!) with Argo Navis DSC's. On planet viewing nights I might bring a Teeter Planet Killer 10" F/7.5 truss Dob with Sky Commander DSC's.

I'm looking forward to seeing many of you there!

John Crilly

From the President

I've been an amateur astronomer for a very long time. As a matter of fact, this month - June 6th, to be exact - marks the 44th birthday of my first telescope - an Edmund Scientific "Palomar Jr" 4¼" f/10 reflector that I lusted over for a year while I saved any money I could scrape together. I ordered it from an ad in National Geographic. I still have that telescope and the issue with the ad, too! It was $74.84 FOB Barrington, New Jersey.

While the telescope was very important to my eleven-year-old mind, the memories of seeing the summer triangle, the beauty of Lyra, Cygnus, Aquila and the hunt - mostly unsuccessful - for the deep sky wonders they contained ranks among my fondest memories. Every time I look at that section of sky, I have the feeling of visiting old friends and knowing they remember the little boy struggling to unlock their secrets.

Actually, my love of astronomy goes all the way back to 1955 when, at the age of 6, I'd ride my 20" Schwinn bicycle to the old two story house that was the Stow Public Library at the time. I remember the feel and smell of those old books so well. The librarian would help me find books on Mars and other planets and I'd carry them home in the basket over the front tire. Sadly, I soon exhausted their supply of astronomy books meant for children, so I graduated to more advanced books that I read, but mostly didn't understand. (You know, I'm *still* reading things I don't understand!) One thing I remember reading about was the transit of Venus coming in June of 2004. That was almost fifty YEARS in the future! And to a very young person, that truly seemed like an unimaginably long time.

Well, guess what? Those fifty years has come and gone. Venus will transit the Sun three days from when I'm writing this. I hope the next fifty years goes as well as this past fifty.

Dave Jessie-Future Past President

Observatory Director's Report

I felt it was that time of the year to remind everyone of a few items of what we'll call "observatory etiquette" during public programs.

I certainly don't want to spoil anyone's fun and I also don't want to have to patrol the grounds but I've noticed that conversations can sometimes get a little loud and raucous. Please try to keep your tone of voice down to normal speaking levels so as not to disturb those around you. Off-color jokes and offensive language are especially a big no-no when you are among the general public.

Alcoholic beverages are strictly forbidden as well as against the law within State Park property. You can be ticketed for simply possessing alcoholic beverages, so please don't even bring any with you.

As club members, we should all take a little pride in how the observatory and grounds look. Please take those few extra steps to use the proper receptacles for trash and cigarette butts. If you spot someone else's trash laying around, please take a minute to help keep the place clean and well groomed.

I personally do not have any strict rules regarding smoking within the observatory. As an outdoor facility, I don't feel restricting smoking is necessary. However, the observatory can frequently get crowded with people waiting for a view through the scope and your smoke can be offensive to many under those conditions. I personally duck outside the double doors where I can still keep an eye on things. Please be considerate of others with your smoking in those situations especially.

Parking is always a problem whenever we have a large crowd and many are not aware of where to park. I really need a little help here. If you see someone trying to park in the wrong place, please lend a hand and politely direct them to an acceptable spot.

Many who attend our programs are first timers. It's in our best interest to make it a pleasurable experience. I frequently notice people walking up who obviously are not sure where to go or what to do. Please also help out with a simple greeting and introduction. Making people feel at home goes a long way to making their experience a pleasant one.

Don't forget. Many of our new members have come from those who casually attend a program or stopped by the observatory. Giving someone a little help with their "department store" telescope without expounding on its problems could really reflect well on the club and cement a relationship.

Ray Paul

NASA Space Place

So Little Time, So Many Galaxies

by Dr. Tony Phillips

This image of Messier 101 (M101), aka the "Pinwheel Galaxy," was taken in two orbits of GALEX on June 20, 2003. M101 is 20 million light years away.

Fourteen billion years ago, just after the Big Bang, the universe was an expanding fireball, white hot and nearly uniform. All of space was filled with elementary particles and radiation. "Soupy" is how some cosmologists describe it.

Today the universe is completely different. It's still expanding-even accelerating-but there the resemblance ends. The universe we live in now is "lumpy." Great cold voids are sprinkled with glowing galaxies. In galaxies, there are stars. Around stars, there are planets. On one planet, at least, there is life.

How we got from there to here is a

mystery. Finding out is the goal the Galaxy Evolution Explorer, "GALEX" for short, a small NASA spacecraft launched into Earth orbit April 28, 2003. GALEX carries an ultraviolet (UV) telescope for studying galaxies as far away as 10 billion light-years.

"GALEX is a time machine," says astronomer Peter Friedman of Caltech. Because light takes time to travel from place to place, pictures of distant galaxies reveal them as they were in the past. "GALEX is investigating the evolution of galaxies over 80% of the history of our universe."

The Hubble Space Telescope can see faraway galaxies, too, but GALEX has an advantage: While Hubble looks in great detail at very small regions of the sky, GALEX is surveying the entire sky, cataloging millions of galaxies during its 2-year mission.

GALEX is a UV mission for a reason. Friedman explains: "UV radiation is a telltale sign of star birth." Stars are born when knots of gas condense in interstellar clouds. The ones we see best are the big ones-massive stars that burn hot and emit lots of UV radiation. "These stars are short-lived, so they trace recent star formation."

Understanding star formation is crucial to studies of galaxy evolution. When galaxies collide, star formation surges. When galaxies run out of interstellar gas, star formation wanes. In galaxies like the Milky Way, spiral arms are outlined by star-forming clouds. The shapes of galaxies, their history and fate: they're all connected by star formation.

Even life hinges on star formation, because stars make heavy elements for planets and organic molecules. "Our measurements of UV radiation will tell us both the rate at which stars are forming in galaxies and the distances of the galaxies," says Friedman.

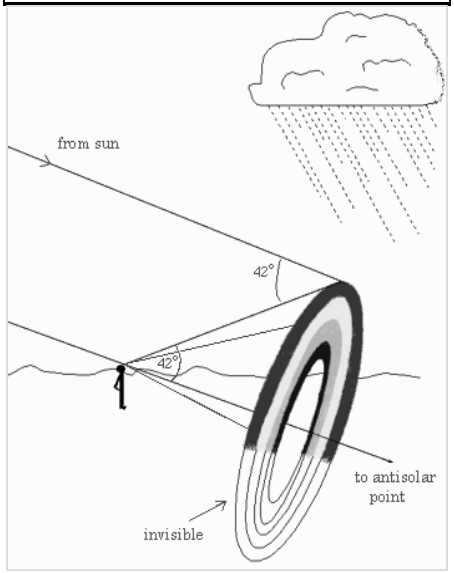
How did we get here? GALEX will show the way.

Find out more about GALEX at http://www.galex.caltech.edu.

For children, visit The Space Place at http://www.spaceplace.nasa.gov/galex_make1.htm and make a beautiful galactic mobile while learning about some of the different shapes galaxies can take.

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

Did You Know?



Rainbows need direct sunshine and falling rain. The sun wrapped drops of showers make the most. But rainbows are rarer than might be thought. In any one place in rainy England there are fewer than ten a year. Halos and coronae occur much more often.

Face away from the sun to see the rainbow. Early morning and late afternoon are the best times. The rainbow's center is the antisolar point, the point diametrically opposite the sun and below the horizon when the sun is up. The lower the sun the higher is the bow's top.

Red is always outermost with orange, yellow, green and blue within. Occasionally, when the raindrops are small, fainter supernumerary arcs of electric greens, pinks and purples lie just inside the main bow.

The rainbow is not only a set of colored rings. The sky inside them is bright because the raindrops direct light there too. Think of the primary bow as a lit disk brightening very strongly towards its rim.

Courtesy of Spaceweather.com

Special Relativity: Time Dilation
By
Lynn M. Laux

Relativity is a widely used term. It is generally used to describe everything from the comical version of $\mathbf{E = mc^2}$ to concepts about time travel. Here, I am referring to the theory called Special Relativity which was first understood by Einstein.

In Einstein's Special Theory of Relativity, he laid down two postulates:

1. The laws of physics are the same in all reference frames.

2. The speed of light through a vacuum (300,000,000 m/s or 186,000 mi/sec) is constant as observed by any observer, moving or stationary.

These postulates led Einstein to the conclusion that if you were moving through space with a constant speed and in a constant direction, the rate at which you would travel forward in time would change. Einstein backed up his theory with sound reasoning which showed that indeed, the faster you travel through space, the slower you travel through time.

Einstein's theory of relativity also predicted an effect of speed on mass observed by a stationary frame for a moving frame as well as an effect of speed on length measured in the direction of motion by a stationary frame for a moving frame.

The faster you travel through space, the more massive you become and the thinner you become in the direction of motion. When I say time slows down for you, your mass increases, and that your width changes, I mean that an observer would see these effects as that observer observes you. According to you, you are not moving and you measure your time, your mass, and your width as you always did. However, for someone not moving along with you, she would see your clock and heart beat run slow, she would see your mass seem to increase (if she pushed you, you wouldn't accelerate as much as she'd expect), and she would see your width in the direction of your motion as thinner.

The consequences of special relativity offer some challenges to conceptualize, but are engaging and intriguing. The effects are often misunderstood as effects that only occur at very high speeds near the speed of light through a vacuum which is 300,000,000 m/s or 186,000,000 miles per second. In fact, all motion, even no motion is under the constraints of special relativity.

The amazing thing about relativity is that it is used on a daily basis by people who make things go near the speed of light for a living. These people include high energy physicists!

Time Dilation

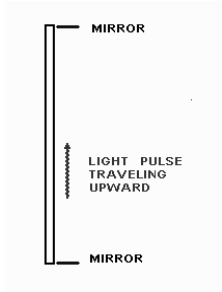
The Time Dilation equation for Relativity is:

$$t = \frac{t_0}{\sqrt{1 - \frac{v^2}{c^2}}}$$

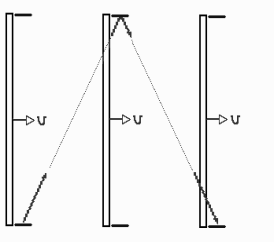
t = time measured for a mover by a stationary observer;
t_0 = time measured for a mover by that mover;
v = the velocity of the mover as measured by a stationary observer;
c = the speed of light.

Where does that come from?

Let's consider a huge clock 300,000,000 meters high (obviously not drawn to scale below). A light pulse goes up and down on the clock reflecting off mirrors on the bottom and top of the clock. We are going to consider the clock while the light clock itself moves to the right with a velocity of 150,000,000 m/s. As seen by someone riding along with the constant velocity light clock, both the clock and the mover seem to be at rest. The light pulse would go 300,000,000 meters up in a time of one second and it would go the 300,000,000 meters down in another second and would not appear to move sideways at all.



The stationary observer will see the clock move up and to the right.



Because of the postulate that light travels at a constant speed, the time observed for the light pulse to travel up to an observer riding with the clock (the mover for the mover) would be different that the time measured for the pulse to travel up and over as measured by an outside frame (the stationary frame for the mover).

The light pulse would travel up and to the right along the hypotenuse of the triangle formed by the light pulse traveling up 300,000,000 meters and right 150,000,000 meters. This means that the stationary observer would see the light pulse travel more than 300,000,000 meters. This means that the stationary observer would see the clock take 1.15 seconds to travel up, and another 1.15 seconds to travel back down. One tick and tock took 2.31 seconds! The mover would say, "2.0 seconds took 2.0 seconds." The stationary observer would say, "Mover, your clock that was supposed to time 2.00 seconds in your frame, took 2.31 seconds in mine!"

I still don't get it…give me the basketball analogy.

Imagine that I gave you a basketball and asked you to dribble it straight down and up with enough speed to cover the distance in two seconds. We would hear the basketball hit the ground one time every two seconds. This is very similar to a light clock with a light pulse going down and then up in a stationary clock. Also remember that as an observer moving along with the light clock, you would see it go straight down and straight up as if you were at rest.

Now I'm going to ask a second dribbler to dribble a basketball next to you. I'm going to ask her to dribble at an angle instead of dribbling straight up and down. I'm going to ask her to dribble to the same height in the same amount of time.

As compared to your ball, her ball will cover more distance as her ball goes side to side and up and down. The ball going side to side would travel more distance because it is now traveling the hypotenuse of the triangle formed by the horizontal distance traveled and the vertical distance dropped. To accomplish this different distance in the same amount of time, she would have to dribble faster than you. Making the analogy with the light clock, the light pulse as seen by the mover for the mover would travel straight down and straight up. The light clock as seen by the stationary frame for the mover would travel a longer distance as it traveled down and to the right, followed by up and to the right. Since light can't travel faster at an angle than it does straight down and straight up, the light as seen by the stationary frame must take more time to go down and up. Another way of saying that is to say that as a stationary frame views one tick of the moving clock (measured as one second by the mover for the mover) as more than one second in the stationary frame of reference.

The equations are nothing more than formulas to calculate measurements in one frame from measurements in another. There must be two frames in order for the formulas to have meaning.

Choose different frames and you'll get different answers. It's like asking if Columbus, Ohio is to the south or not without giving any leeway as to where the asker might be located.

Next month: length contraction…..

Eureka!
By
Pete Flohr

On the evening of May 8th, 2004, many of the ACA members were taking advantage of a rare clear Saturday sky. Almost immediately upon my arrival Cathy spotted one of the many satellites to cruise across the sky. Later observatory director Ray Paul shouted out that he saw a meteor! Several more soon followed, but the highlight of the evening for myself as well as others was when ACA member Lynn Laux (using her excellent math skills) pinpointed the exact location of Comet NEAT. This comet has a very low magnitude and was not visible to the naked eye. Ted Faix swing his binoculars to the WSW and eureka! There was Comet NEAT. Many claimed to

make out the faint tail and soon Ray zoomed the ACA scope in so that all could see it. This must be one of the first views of the comet in NE Ohio. The comet was visible for about an hour and then it faded into the horizon. Everyone had a great time that night!

Kind regards, Pete Flohr.

Far Out Ideas
By
Patrick L. Barry

Ever had a great idea for a new spacecraft propulsion system, or for a new kind of Mars rover? Have you ever wondered how such "dinner napkin sketches" evolve into real hardware flying real missions out in the cold blackness of space?

The road to reality for each idea is a unique story, but NASA has defined some common steps and stages that all fledgling space technologies must go through as they're nursed from infancy to ignition and liftoff.

Suppose, for example, that you've thought of a new way to shield astronauts from harmful radiation during long space missions. In the first stage, you would simply "flesh out" the idea: Write it down, check the physics, and do some quick experiments to test your assumptions. If the idea still looks good, the next step is to build a "proof of concept." This is the "science fair project" stage, where you put together a nifty demonstration on a low budget-just to show that the idea can work.

For your radiation-shielding idea, for example, you might show how a Geiger counter inside a miniature mock-up doesn't start clicking when some radioactive cobalt-60 is held nearby. The shielding really works!

Once that hurdle is cleared, development shifts into a higher gear. In this stage, explains Dr. Christopher Stevens of JPL, the challenge isn't just making it work, but making it work in space.

"Some conditions of space flight cannot be adequately simulated here on Earth," Stevens says. Cobalt-60 doesn't truly mimic the diverse mixture of radiation in space, for example, and the true microgravity of orbit is needed to test some technologies, such as the delicate unfolding of a vast, gossamer solar sail. Other technologies, such as artificial intelligence control systems, must be flight tested just because they're so radically new that mission commanders won't trust them based solely on lab tests.

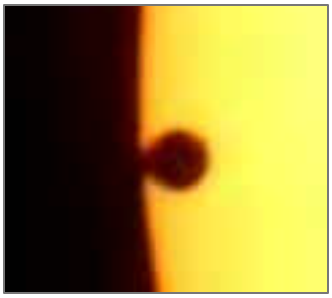
Stevens is the manager of NASA's New Millennium Program (NMP), which does this sort of testing: Sending things to space and seeing if they work. In recent years the NMP has tested ion engines and autonomous navigation on the Deep Space 1 spacecraft, a new "hyperspectral" imager on the Earth Observing 1 satellite, and dozens of other "high risk" technologies.

Thanks to the NMP, lots of dinner napkin sketches have become real, and they're heading for space. You can learn more at the NMP website: nmp.nasa.gov

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

Contributed by Rich Ruggles

Historic Transit of Venus



On the morning of June 8 many were able to see the historic transit of Venus! Observatory Director Ray Paul was set up on the beach at Portage Lakes State Park and Club President Dave Jessie was set up at the KSU airport in Stow. The transit was in progress as the sun rose…

No one alive has ever seen a transit of Venus…it last happened on December 6, 1882, and you won't have another opportunity until June 6, 2012. After that…well, it won't come around again until the year 2117.

If you viewed the transit, and have a story to tell, please send me your articles and pictures for the July 2004 edition of "The Night Sky".

Don't forget to mail in your dues this month if you have not already done so!
The June issue will be the last one mailed out to those who have let their membership expire!

Article Submission

The deadline for article submission is **two weeks after the last meeting.** In the summer months, when there is no meeting, the deadline is **two weeks after the fourth Friday of the month.** All word processing files should be saved in any version of **Word** to minimize import problems.
If you don't have access to a computer, don't hesitate to write something out long hand.
Send in your articles, items for sale, and comments to:

Lynn M. Laux
14274 Bridle Trail
Strongsville, OH 44136

Or email:
gemmalady@msn.com

If you have any pictures of club events, astronomical images, rig pictures and the like, please submit them to:

http://groups.yahoo.com/group/astronomyclubofakron

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SKY CALENDAR JULY 2004

An aid to enjoying the changing sky

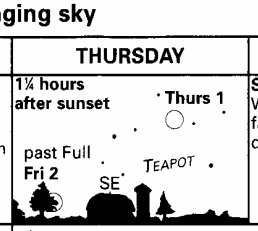
Planetarium business office:
(517) 355-4676
Skywatcher's Diary on World Wide Web:
http://www.pa.msu.edu/abrams/diary.html

Use this scale to measure angular distances between objects on diagrams below.

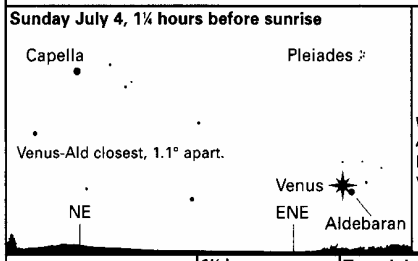
0° 10° 20°

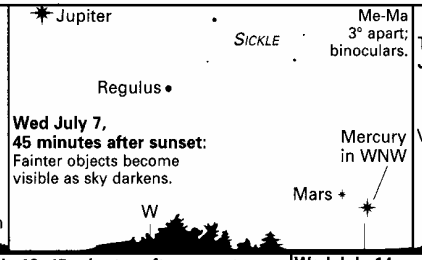
SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY

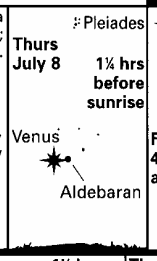
Venus and Aldebaran: On morning of July 3, Venus passes 1.2° N of Aldebaran. This is their 3rd conjunction in longitude within 3 months, with Venus having passed nearly 10° N of this star on April 14, and 1.9° N of the star on June 26. (The June 26 and July 3 conjunctions are associated with just one least separation, 1.1° on July 4 & 5.) On July 3 Venus completes its first ***triple conjunction*** with Aldebaran since 1817. There will be a triple conjunction between these two bodies every 8 years 2004-2060, then none until a new series begins in 2247. Triple conjunctions between Venus and a star can occur only within 55 days of the date Venus passes ***inferior conjunction,*** between Earth and Sun. Around inferior conjunction (June 8 this year), the planet appears to ***retrograde,*** or go west against the stars, making the 2nd and 3rd conjunctions possible.

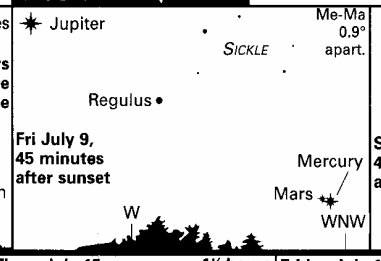


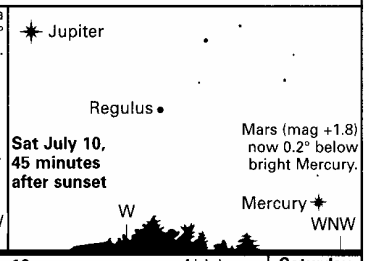
Sat July 3, 45 min after sunset: Mercury is very low in WNW, 45° lower right of Jupiter. Binoculars may show faint Mars 7½° upper left of Mercury, and Pollux a similar distance to Mercury's right.

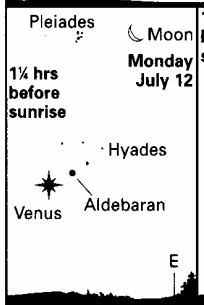


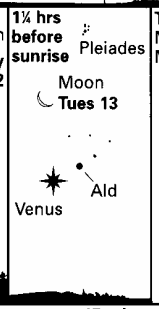


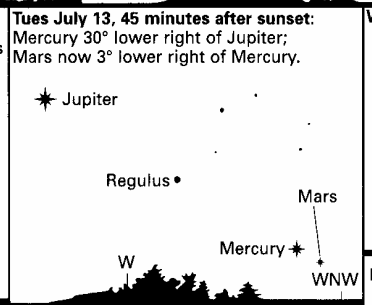


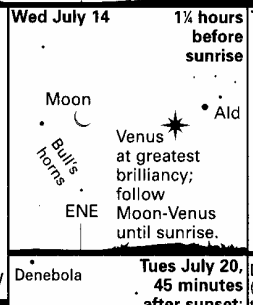


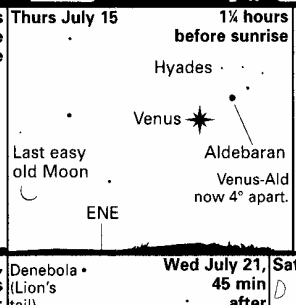


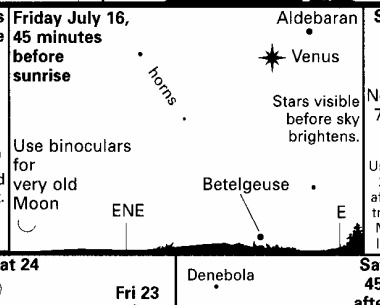


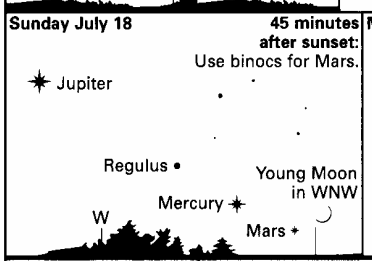


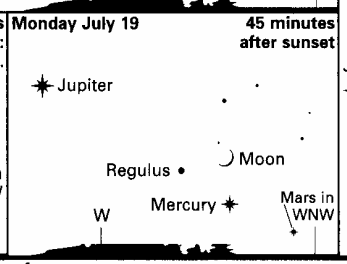


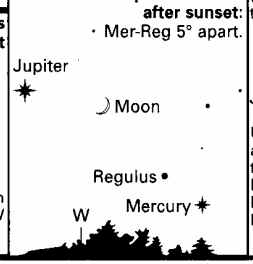


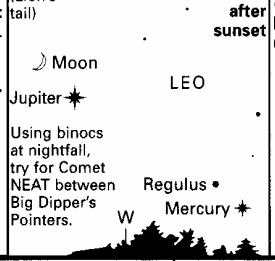


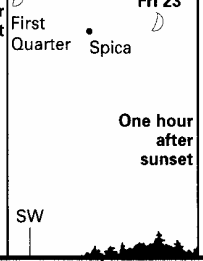


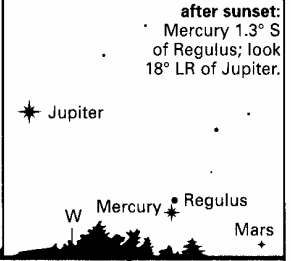


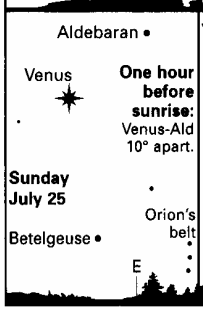


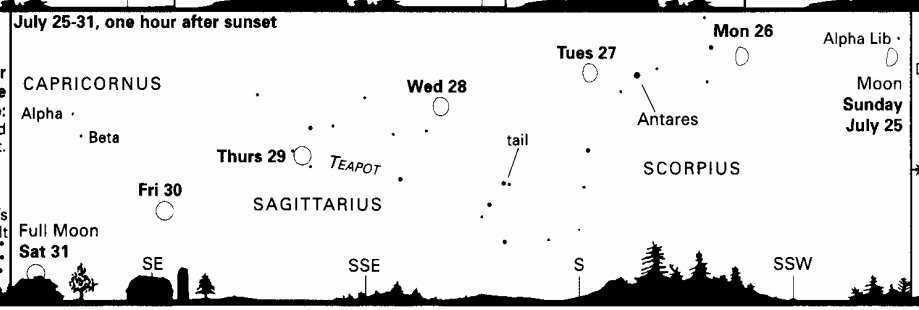


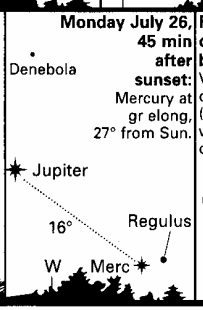


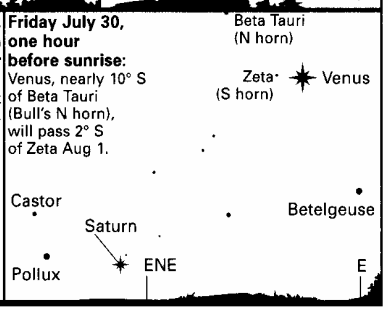












The three planets visible at dusk are shown in the calendar drawings for July 7, 9, 10, 13, 18, 19, 20, 21, 24, and 26. **The Moon** overtakes all three planets during July 18-21. Here are the evening planets, in order of brightness: **Jupiter** sinks low in W to WNW as month progresses. With the departure of Venus in early June, Jupiter at mag. –1.8 has taken over as the brightest "star" in the evening sky. **Mercury** is low in evening twilight in all of July, starting in WNW and shifting toward W late in month. It is brightest (mag. –0.7) but lowest on July 1, passes through mag. 0 near midmonth when it is highest (less than 5° up in midtwilight) for observers at lat. 40° N, and fades to mag. +0.7 at month's end. Mercury overtakes Mars on July 10 and Regulus on July 24. Binoculars will help you spot the fainter objects in the twilight glow. **Mars** (mag. +1.8), as faint as it ever gets, finally disappears into the solar glare, nearly a year after its record close approach to Earth of late August 2003. Check the drawings for Mars' position with respect to brighter Mercury.

Nightfall: Comet C/2001 Q4 (NEAT), remaining in Ursa Major until almost the end of August, fades from about 7th to 8th magnitude this month. On July 21, it passes between the Pointer Stars of the Big Dipper.

Planets at dawn: Venus, climbing higher in E to ENE morning sky, rises ahead of the Sun by 1¼ hours on July 1, to over three hours at month's end, as seen from lat. 40° N. The Moon appears nearby on the mornings of July 13 and 14, aiding in daytime sightings of Venus at its greatest brilliancy, mag. –4.5. A daytime sighting of Venus as a morning "star" is easy: Just follow Venus until the sun rises. How long after sunrise can you still find Venus? Against the stars of Taurus, Venus lingers near Aldebaran early this month (passing just 1.1° from that star on the mornings of July 4 and 5) and passes 2° S of Zeta, the Bull's southern horn, on Aug. 1. See drawings for July 4, 8, 12, 13, 14, 15, 16, 25, and 30. Through a telescope or binoculars, Venus shows a crescent, waxing from 15 percent to 40 percent while shrinking in size from 0.8 to 0.5 arcminute across. The best time to observe the crescent is right at sunrise or in daylight, to reduce the contrast of the glare of brilliant Venus against the darker sky. **Saturn** emerges low in ENE by last week of July. Look for a 0.1-mag. "star" far to the lower left of Venus and 8° right of Pollux, and one magnitude brighter than that star. See drawing for July 30.

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