

October 2006

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**Edmund G. Kline Dark Site Work**

**Wayne Kaaz**

WOW, its got more pads than a line backer. Not really, but there are four new 10' X 10' concrete pads at the EGK Dark Site. I want thank all of those the worked on this project: Bob MaeArthur, Mickey Smith, and Joe Gafford, Jim Holder and his wife Sarah, Bryan Wilburn, Ken Takahashi, Ted Cox, Darrell Dodge (Our V.P.), Rodney Pinkney, and myself. The site is still a bit of a construction site, so be careful out there!




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**Special Note:** The September Newsletter was quite literally lost before it hit the mail. People wanting a paper copy should contact Wayne Green, who takes responsibility for losing the thing in the first place.

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***Pleiades Occultation in October***

**Wayne Green**

The Moon's path through the skies causes it to get between Earth and other more distant celestial objects. This month many of the stars in the Pleiades open cluster will be occulted, or blocked from view. Timing the disappearance and reappearance of these stars makes several scientific contributions: refining the position of the stars, determining the orbital elements of the Moon, helping to make precise measurements of the radius of the Moon at the point of disappearance, and sometimes discovering close double stars.

The International Occultation Timing Association, or IOTA, is a group of serious amateurs and professional astronomers dedicated to making these timings. They publish the Occult 3.6 program generating predictions that allow us to make sure we're ready with our timing equipment to gather the data. See the table below.

Late on the evening of 9 October, the Moon will wander through the Pleiades. This is one of a series of Pleiades occultations that repeats every 18.6 years or so. This event will see a bright waning Moon

(86%) passing through the star field, starting around 8:00PM. The most significant events will be the reappearance of bright stars on the trailing dark limb of the moon.

The DAS Science Program will attach a camera to the Clark telescope, together with an accurate time source and record as many reappearances as we can. The event occurs on a night that DU classes are held, so we will do basic setup in the late afternoon, hide while the class is conducted, and return around 9:30PM to make the observations.

Observations of this nature require testing and practice. So we will be doing some occultation timings with stars prior to the 9 October event.

Join the DAS Public Night teams and the DAS science group on 9 October, starting around 9:30PM at Chamberlin to watch and time this passage of the Moon through the Pleiades.

Duration of Partial Stage for Pleiades Cluster = 423 mins

Star	Event	Time(UT)	RA	DEC	Alt	Az	PA	Star Mag/Data/Name
17 Tauri	D	3:54:17	3:44:52.5	+24 6:48	19	74	34	3.9/7.0/7.5
23 Tauri	D	4:17:45	3:46:19.6	+23 56:54	23	78	97	4.18 Merope
17 Tauri	R	4:41:23	3:44:52.5	+24 6:48	28	81	278	3.9/7.0/7.5 Electra
eta Tauri	D	4:47:40	3:47:29.1	+24 6:18	29	81	89	1.5/3.0/4.6/2.8 Alcyone
20 Tauri	M	4:49:17	3:45:49.6	+24 22:04	30	82	335	4.4/5.4 Maia
23 Tauri	R	5:06:52	3:46:19.6	+23 56:54	33	85	214	4.18 Merope
549SA0	R	5:41:12	3:47:21.0	+24 6:59	39	89	227	6.3 Multiple
28 BU Tauri	d	5:42:03	3:49:11.2	+24 8:12	39	89	128	5.0/4.77-5.50V Pleione
eta Tauri	R	5:42:50	3:47:29.1	+24 6:18	40	90	222	1.5/3.0/4.6/2.8 Alcyone
28 BU Tauri	R	6:10:13	3:49:11.2	+24 8:12	45	94	181	5.0/4.77-5.50V Pleione

Predictions from Occult 3.6/IOTA for Chamberlin Observatory.

## October Skies 2006

Ron Mickle

As in September, Jupiter starts this month at mvis -1.8, with an apparent diameter of 32 arcsecs. For comparison, remember that the moon subtends an angle of approximately 30 arcmin. The gas giant still dominates the early October sky, but by month's end, sets about one hour after the Sun, therefore, is difficult to view. When viewing Jupiter, remember to look for the four Galilean moons.

Saturn will not rise until after 0300 hours MDT, and only slightly earlier during Standard Time. By morning twilight, the ringed planet will be high in the southeast keeping close to Regulus. As stated in the September Observer, Saturn's rings are tilted less than 15° for the first time in eight years and are excellent viewing.

The Full Moon on October 6 is the closest full moon to the September equinox, therefore is referred to as the Harvest Moon. Around the 20th, the thin crescent moon allows for viewing of the Orionids meteor shower. The radiant for the showers will be located in Orion's Club asterism.

To get a great view of the planets, stars, and other celestial objects, visit the Denver Astronomical Society's Open House at sunset on Saturday, October 28 at the University of Denver's Historic Chamberlin Observatory. This month's Open House coincides with Colorado Astronomy Day. Remember that members of the Denver Astronomical Society have free access to the Clark 20' at Chamberlin Observatory during Open House.

6 Full Moon (also called the Harvest Moon)	OCTOBER PREDOMINANT OBJECTS		
	Description	RA	DEC
13 Last quarter Moon	M13, globular cluster	16h 41.7m	36° 27'
20-21 Orionids meteor shower	ε Lyrae, double-double	18h 44.4m	39° 40'
	M57, Ring nebula	18h 53.6m	33° 02'

	Description	RA	DEC
22	New Moon		
29	First quarter Moon	19h 30.7m	27° 58'
30	Savings ENDS, clocks 'Fall Back' 1-hour	$\alpha$ Capricorni, double- double	22° 43'
	M31, Andromeda galaxy	0h 42.7m	41° 16'
	M33, Triangulum galaxy	01h 33.9m	30° 39'
	Perseus double cluster	02h 21.5m	57° 08'
	$\iota$ Cassiopeiae, triple star	02h 29.0m	67° 24'
	Pleiades	02h 47.5m	24° 06'

References: Astronomical Calendar 2006 and Sky & Telescope Magazine, October 2006

## President's Corner

Welcome to the fall of the year. We have an occultation of the Pleiades by the Moon as a special DAS members-only event for Chamberlin Observatory. We have the annual DAS auction and Colorado Astronomy Day as well. These are events where you can spend a lot of time discussing your observations and plans for the upcoming season. This gives you a chance to latch-up a project for the DAS November show-and-tell meeting.

The occultation of the Pleiades is late on the evening of 9 October. This event will be a serious effort by our Science Section to acquire meaningful data and to make a video record of the event. DU students will be at the observatory for classes early in the evening, and will hopefully join us later.

DAS holds an annual auction in lieu of a regular October meeting. The auction is a lot of fun, and a good way to acquire telescopes, or their parts for experiments over the next year.

We ask that only materials related to astronomy be brought to the auction. Leave those old monitors at home. I am always *amazed* at what I bring home. My wife uses a different term.

This year Colorado Astronomy Day occurs on the 28<sup>th</sup> of October. This is an opportunity to show the rest of the AL how to do a Fall season event. That said, let's hope for clear skies.

Recent work at the Dark Site has increased the number of pads with electrical power available. There is a growing interest in observing and taking astro-photos at the site. This recent work removes any excuse for not heading east to dark skies. I want to thank the DAS Dark Site committee for pulling themselves together and getting these results. They are getting plans together for another push in the spring. Thanks again for the great effort.

The fall usually brings crisp, clear skies. Now is a great opportunity to get the mildew of this summer out of your telescope and enjoy some of the best observing we have along the front range. --Wayne Green

## Society Directory

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##### **Colorado Astronomy Day:** Darrell Dodge

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##### **Newsletter:**

##### **Picnic:**

##### **IDA Representative: Robert Stencel**

##### **DAS Information Line: 303.871.5172**

##### **DAS Correspondence:**

*The Executive Board conducts the business of the DAS at 8 P.M. at Chamberlin Observatory. Please see the Schedule of Events for meeting Dates. All members are welcome.*

## ***Colorado Astronomy Day***

**Darrell Dodge**

On Saturday, October 28th, the Denver Astronomical Society and other Colorado science organizations will celebrate Colorado Astronomy Day 2006. Colorado Astronomy Day was established by governor's proclamation in 1997. With National Astronomy Day moving to late September in 2007, this may be the last "stand-alone" Colorado celebration.

DAS volunteer set-up activities begin at 9 am at the Denver Museum of Nature and Science, with the public access beginning at 11 am and going until 4 pm. DAS members will conduct solar observing through their telescopes on the Atrium level at the museum. Operators will be asked to sign a statement that their solar filters are in good working condition. At press time, five DAS members had volunteered to bring their solar scopes. Several more would certainly be welcomed.

There will be informative and entertaining presentations at the DMNS on Aurorae, life in the universe, the future of deep space infrared astronomy, and the new solar system. Details are provided in the preliminary schedule.

Meanwhile, Fiske Planetarium and Science

### **Preliminary Schedule of Activities**

Denver Museum of Nature & Science, Denver

9 am—6 pm: Gates Planetarium/Space Odyssey Open

11 am—3 pm: Solar Observing (Atrium) Denver Astronomical Society

Astronomy presentations and lectures:

- Bryan White, 3-D Aurora Multimedia Show
- Dr. David Grinspoon, DMNS, Astrobiology
- Dr. Roger N. Clark, The New Solar System
- Dr. Robert Stencel, DU, The Future of Infrared Astronomy

Fiske Planetarium and Science Center, Boulder

2 pm—5 pm: Ancient Astronomy of Mexico

DU's Historic Chamberlin Observatory, Denver Astronomical Society

6:00 pm: Multimedia Presentation: The Sky Tonight

6:30 pm—11pm: Astronomy Displays & Exhibits

6:30 pm—11pm: Astronomical Observing

Center on the CU Boulder campus will host an 'Ancient Astronomy of Mexico' celebration from 2pm to 5 pm with activities continuing into the evening.

In the evening in Denver, the Denver Astronomical Society and Active Teens of the Museum will host an open house at Chamberlin Observatory. We will have the usual presentations and exhibits in the observatory. We're hoping for a big crowd for this event, so be sure to bring your telescope. Large Dobs and imaging set-ups would be especially interesting to the public attendees.

If you would like to volunteer to help with solar or astronomical observing a special display or general support, please contact Darrell Dodge at 303-932-1309 or e-mail [dmdodge@aol.com](mailto:dmdodge@aol.com). More information on Colorado Astronomy Day is available on the Web site at: [www.coloradoastronomyday.org](http://www.coloradoastronomyday.org) Information will be updated right up to the event.

There is a flier in PDF format on the Web site. Please feel free to download the brochure, print it with your color or black and white printer and distribute it as you want.

## *An Historic Transit of Mercury at Chamberlin Observatory, University of Denver.*

by Ron Pearson,  
Denver Astronomical Society

On November 8<sup>th</sup>, given clear daytime skies, many members of the DAS, perhaps numerous members of the public, media, and Dr. Robert Stencel, Observatory Director, will be watching a small, round object move across the face of the sun. The tiny black disk will be the planet Mercury. Some of those observing this astronomical phenomenon will be using the 20-inch Alvan Clark refractor, the 6-inch Grubb telescope ‘finder’ or perhaps looking through the 5-inch Clark ‘finder’ on the side of the great 20-inch. Others may be out on the south lawn with their personal telescopes viewing the event.

Given that planets move in nearly circular orbits about the sun along the path called the ecliptic or plane of their orbits, it should be no surprise that occasionally one of the “inferior” planets, Mercury or Venus, passes in front of the sun. And, given that Chamberlin Observatory and its Clark refractor have made 112 orbits of the sun with the Earth since they were constructed, it is not surprising that other transits of Mercury would have been observed with Chamberlin’s 20-inch telescope.

NASA Astronomer Fred Espenak [1] explains the recurrences of transits of Mercury:

“All transits of Mercury fall within several days of 8 May and 10 November. Since Mercury's orbit is inclined seven degrees to Earth's, it intersects the ecliptic at two points, or nodes, which cross the Sun each year on those dates. If Mercury passes through inferior conjunction at that time, a transit will occur. During November transits, Mercury is near perihelion and exhibits a disk only 10 arc-seconds in diameter. By comparison, the planet is near aphelion during May transits and appears 12 arc-seconds across. However, the probability of a May transit is smaller by a factor of almost two. Mercury's slower orbital motion at aphelion makes it less likely to cross the node during the critical period. November transits recur at intervals of 7, 13, or 33 years while May transits recur only over the latter two intervals.”

This year, it is of special note, though, that if we could turn the clock back 112 Earth orbits of the sun, we would see Chamberlin Observatory, the Observatory director, his students, and his wife making timings with the same, but brand new great 20-inch telescope, and the 5-inch Clark finder, while others are in the “Student Observatory” adjacent to Chamberlin observing and making timings with the Grubb telescope. Only a few months after first light for the observatory occurred in July, 1894, a transit of Mercury occurred on November 10. These observations and timings would be the first science to be done using Chamberlin’s 20-inch telescope and would be published by the U.S. Naval Observatory.

It was Edmond Halley that realized that if accurate enough timings could be made of the transits of Mercury or Venus, a distance scale of the solar system could be derived. Timing these transits then became an extremely important goal for early astronomers. By 1894 the scale of the solar system was pretty well determined from earlier transits, although more accurate measurements were needed to refine the numbers. Perhaps this was a ‘learning opportunity’ for DU students to learn how to make observations and reduce them mathematically. It was also an opportunity to make possibly important discoveries about the nature of the planet Mercury itself. The physical nature of Mercury was largely unknown at the time due to its small size and close position to the sun. As Chamberlin’s first director, Dr. Herbert Howe noted in his book, “A Study of the Sky” [2]:

“Of Mercury little is known, for it is coy and keeps close to the sun... It is very difficult to make out any markings on Mercury’s disk... There is great uncertainty about the presence of air or water; certain spectroscopic observations indicate that there may be a thin atmosphere, in which water vapor is present.”

The observations reported to the U.S. Naval Observatory read as an observing log of the event, clearly describing all details of how the timings were made, who made them –giving credit to his students and the problems and poor seeing conditions encountered. Tables of reduced timings are reported for three groups of observers. A brief summary of the first descriptions reads:

“I. The instrument used was a 20-inch equatorial refractor, aperture reduced to 12-inches; polarizing eyepiece with a power of 220 diameters. The timepiece was a sidereal chronometer, Frodsham No. 2593...

Mr. Eugene M. Antram counted loudly the seconds indicated by the chronometer face, and I noted according to his counting. I looked for the planet before first contact, but did not see it until the notch was quite large...A ring of light was looked for around the invisible part of the planet’s disk, between first and second contacts, but none was seen. The planet was seen through light clouds and definition was poor...I waited patiently in the hope that the seeing might improve...Finally, at a critical moment geometrical contact seemed to be well seen and time was noted accordingly. I made a hand signal with my hand to two students, Mr. Ralph Brann and Miss Nan McFarland, when I was sure that the second contact had not yet come...”

“During the transit the planet was looked for occasionally to detect evidences of atmosphere, or possible satellites, or shadings on the disk. The definition varied from very bad to fair. “

“II. Herbert E. Russell, associate professor of mathematics in the University of Denver, made the following observations with the equatorial of the Students’ Observatory: ...The instrument used was a 6-inch Grubb equatorial, eyepiece Herschelien, with a power of 99 diameters. The timepiece was a Fauth mean time clock with the chronograph.

“III. Mrs. Herbert A. Howe used the 5-inch finder of the 20-inch equatorial, equipped with a Herschelien eyepiece magnifying 120 diameters. Her timepiece was the Fauth sideral clock of the observatory, connected with a chronograph. In the morning, the chronograph pen worked badly and there was no indubitable record of her observations. “

The observatory was the fulfillment of the dream of Dr. Howe, Chamberlin’s first director and of Humphrey Chamberlin, who wanted to bring the joy of astronomy and a great telescope to the ‘wilds’ of Denver, Colorado during the close of the frontier west. For Dr. Howe, this was the beginning of 32 years of contributions to astronomy and teaching students how to observe and measure the objects in the sky. On Earth 112 years have passed, 464 Mercury years and their great refractor continues to observe the sky and provide students perhaps their first opportunities for learning astronomy with all its joys and frustrations.

References:

[1] <http://sunearth.gsfc.nasa.gov/eclipse/OH/transit03.html>

[2] A Study of the Sky. Herbert A. Howe, 1896. The Chatauqua-Century Press.

[3] Observations Made At the Chamberlin Observatory of the University of Denver. Report of Prof. Herbert A. Howe. Publications of the U.S. Naval Observatory 9. p. 682.

## ***Transit of Mercury***

### **An Interview with John Westfall, ALPO**

Wayne Green

Transits of Mercury occur in the months of May and November. This November 8<sup>th</sup>, we get to watch most of a transit from Denver. We plan to join with Dr. Stencil and observe the passage of the Mercury from first contact around 12:12PM and running until sunset. Transits have 4 main events called contacts: 1<sup>st</sup> and 2<sup>nd</sup> contact occur when the planet first touches the limb and when the trailing edge of the planet leaves the limb. The next main events are 3<sup>rd</sup> and 4<sup>th</sup> contact, when the planet makes it to the other side of the Sun. These last two will happen after Mercury sets for us here in Denver. Other events

occur when the planet passes sunspots and other features on the Sun's surface.  
 An email interview with John Westfall of ALPO gives the following observing tips.

*With Mercury's disk less than 10 arc-seconds across, it will be necessary to use at least 100X or so for visual observing -- no problem for your 20-in Clark, but more than the usual Coronado PST eyepiece provides, so you may need to use either a shorter FL eyepiece or a Barlow lens with the PST. Also, if you plan to stack webcam frames, I don't recommend stacking more than a few seconds' worth because of Mercury's rapid motion in relation to the Sun.*

*As you will be timing ingress only, the apparent time of First Contact will be when you first observe a notch on the Sun's limb, caused by Mercury starting to encroach on the photosphere. (Looking through the PST may give you some previous warning of when and where on the limb this will happen.) Apparent Second Contact is when you first see light completely around Mercury's disk (i.e., if the "black drop" effect is present, when the black-drop filament finally breaks). Note any shading between the limbs of Mercury and the Sun, particularly if the shading varies rapidly. It will also be interesting to compare timings made through telescopes of different sizes and magnifications.*

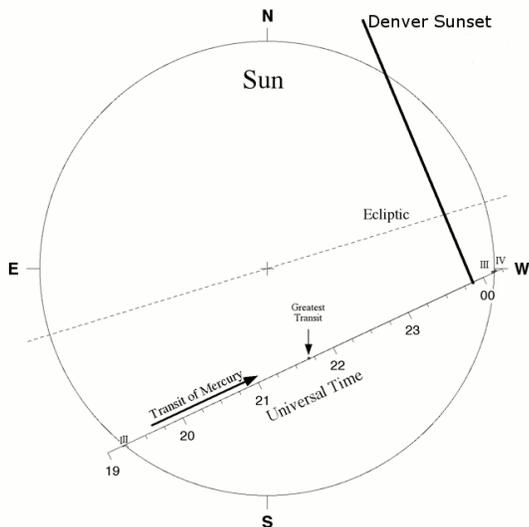
*Note any apparent illumination on Mercury's disk, or a light or dark ring around Mercury as it crosses the Sun. If we are fortunate enough to see Mercury cross a sunspot, any changes in the planet's appearance should be noted. Also, if possible, compare the darkness of Mercury's disk with sunspot umbrae and penumbrae.*

*They [sketches] need not be artistic ("pretty") as long as they accurately record the observer's impressions, particularly of faint or brief phenomena that are difficult to image.*

*I am planning to publish a report on the event, and I'm sure our readers would like to hear about public interest in the event; how many looked through telescopes and their reaction to the event.*

He offers some words of encouragement: *This will be the last transit of Mercury for 10 years, and the most favorably placed one for Denver until 2061. (Note, however, that some of the 2012 transit of Venus will be visible from Denver.) Some effects that may surprise people are (1) the tiny size of Mercury compared with the Sun, even though Mercury will be closer; (2) How rapidly Mercury will move in relation to the Sun; and (3) how intensely black Mercury's disk will appear.*

Image of the Sun taken from Fred Espanak's site, showing the approximate path of the Transit. The view will be a tad different from that seen here in Denver.



Approximate Contact Times:

12:12:04 PM MST    Contact I  
 12:13:57 PM MST    Contact II

Contact III and Contact IV occur after the Sun sets.

Greatest Transit: 2:41PM MST.

Times taken from Fred Espanak's prediction page.

## About the Denver Astronomical Society

Membership in the Denver Astronomical Society is open to anyone wishing to join. The DAS provides trained volunteers who host educational and public outreach events at the University of Denver's Historic Chamberlin Observatory, which DAS helped to place on the National Register of Historic Places. First light at Chamberlin in 1894 was a public night of viewing, a tradition that DAS has helped to maintain since its founding in 1952.

The DAS is a long-time member in good standing of the Astronomical League.

The DAS credo is to provide members a forum for increasing and sharing their knowledge of astronomy, to promote astronomical education to the public, and to preserve Historic Chamberlin Observatory and its telescope in cooperation with the University of Denver.

The DAS is a 501(c)3 tax-exempt corporation and has established three tax-deductible funds: the Van Nattan-Hansen Scholarship Fund, the Public Outreach Fund, and the Edmund G. Kline Dark Site Fund. To contribute please see the bottom of the membership form for details. More information about the DAS, its activities, and the special tax-deductible funds is available on the DAS website, at [www.thedas.org](http://www.thedas.org).

## Application for Membership

Name \_\_\_\_\_

Address \_\_\_\_\_

City, State, Zip \_\_\_\_\_

Phone \_\_\_\_\_

E-mail Address \_\_\_\_\_

Students Only: School \_\_\_\_\_ Grade \_\_\_\_\_

Download this newsletter and save DAS \$15/year:

YES      NO

Do you want the information above included in the DAS Roster?

YES      NO

\$35 .00 Regular Membership

\$20 .00 Student Membership

\$34 .00 Astronomy Magazine

\$32.95 Sky and Telescope

\$ \_\_\_\_\_ Van-Nattan Hansen Scholarship Donation

\$ \_\_\_\_\_ Public Outreach Donation

\$ \_\_\_\_\_ Dark Site Donation

\$ \_\_\_\_\_ Total Amount Enclosed

Please make checks payable to the Denver Astronomical Society and mail to the Treasurer:

Bradley Gilman, 7003 S. Cherry St. Centennial, CO 80122-1179.



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