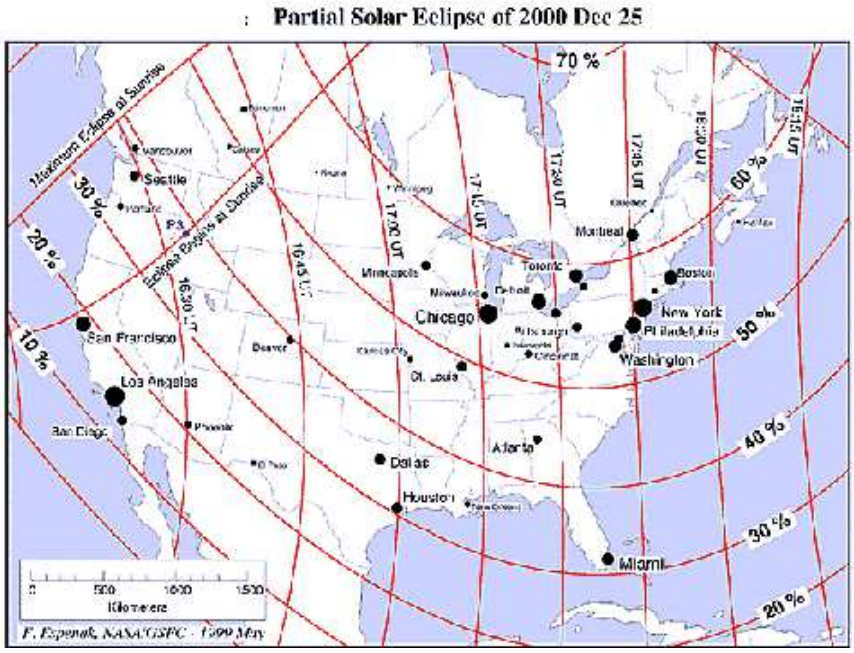
# REFLECTIONS
## of the University Lowbrow Astronomers

**December 2000**

The University Lowbrow Astronomers is a club of Astronomy enthusiasts which meets on the third Friday of each month in the University of Michigan's Physics and Astronomy building (Dennison Hall, Room 130 or 807). Meetings begin at 7:30 pm and are open to the public. Public star parties are held twice a month at the University's Peach Mountain Observatory on North Territorial Road (1.1 miles west of Dexter-Pinckney Road; further directions at the end of the newsletter) on Saturdays before and after the new Moon. The party may be canceled if it's cloudy or very cold at sunset. For further information call (734) 480-4514.




Credit: F. Espenak - *NASA/GFSC*

The final eclipse of the Second Millennium is a partial solar eclipse on Christmas day. Fortunately, the event will be well placed for observers throughout most of North America (see the map above and on the last page). First and last penumbral contacts occur at 15:26:37 UT and 19:43:12 UT, respectively. Greatest eclipse 1 occurs at 17:34:51 UT with a maximum eclipse magnitude of 0.7231 from Baffin Island. Most of North America will witness the event with the exception of northwestern Canada and Alaska. The detailed map can be used for estimating eclipse magnitudes and Universal Time of maximum eclipse for locations throughout the continent. (***this topic continues on page 2***)

## This Month:

**December 15** - Meeting at 130 Dennison - "Variable Cataclysmic Stars" --- Mike Simonsen

**December 23**- Public Star Party at Peach Mountain Observatory - It's now officially winter.

**December 30**- Public Star Party at Peach Mountain Observatory - eve of the last day of the Millennium. Observe it with us.

## Next Month & ----

**January 19** - Meeting at 130 Dennison -

**January 20**- Public Star Party at Peach Mountain Observatory

**January 27**- Public Star Party at Peach Mountain Observatory

**February 16** - Meeting at 130 Dennison

**February 17** - Public Star Party at Peach Mountain Observatory.

**February 24** - Public Star Party at Peach Mountain Observatory.

**March 16** - Meeting at 130 Dennison.

**March 17** - Public Star Party at Peach Mountain Observatory.

**March 24** - Public Star Party at Peach Mountain Observatory.

## Continued from page 1, The Partial Solar Eclipse of December 25, 2000

Credit Fred Espenak, NASA/GSFC

Press Release
The Last Eclipse of the 2nd Millennium!
Partial Solar Eclipse of December 25, 2000
Fred Espenak, NASA/GSFC

The final eclipse of the Second Millennium1 occurs on Christmas Day, December 25, 2000. The event is a partial eclipse of the Sun which will be visible for observers throughout most of North America.

1The Second Millennium ends on December 31, 2000 NOT 1999 as was erroneously and irresponsibly reported by the media last year. Our current method of dating years begins on January 1 of the year 1 A.D., not year 0 A.D.. Anyone capable of 3rd grade arithmetic will tell you that the First Century ended on December 31, 100 A.D., and not 99 A.D.. Similarly, the First Millennium ended on December 31, 1000 A.D.. But I digress...

An eclipse of the Sun can only take place at New Moon, and only if the Moon passes between the Sun and Earth. Under these conditions, the Moon's shadow sweeps across a portion of Earth's surface and an eclipse of the Sun is seen from that region. For more information on the what, why, how, when and where of solar eclipses, see the special web site solar eclipses for beginners.

The Christmas eclipse will be visible from United States (except Alaska and Hawaii), Canada, Mexico, Central America, the Caribbean and the North Atlantic. A global map of Earth shows the region of eclipse visibility. During the maximum phase (17:23 GMT) about 72% of the Sun's diameter will be covered by the Moon. Unfortunately, this takes place from Baffin Island in northern Canada. More populated locations further south in North America will see a smaller fraction of the Sun's face covered by the Moon. The eclipse magnitude varies across the USA from over 60% in the northeastern to under 20% in the far southwest. Eclipse magnitude is simply the percent of the Sun's diameter covered by the Moon. A more detailed map of North America shows the region of eclipse visibility and plots eclipse magnitude curves for different geographic locations. Times on the map are in Universal Time (UT) which is equal to Greenwich Mean Time. A unique eclipse animation shows the motion of the Moon's shadow across Earth's surface during the eclipse (courtesy of Dr. Andrew Sinclair).

Extreme care must be taken when watching the solar eclipse. You should visit a web site which discusses a number of ways to Safely View the Eclipse. The eclipse itself is no more dangerous to view than the Sun is on any other day. The only difference is that human curiosity impels some people to stare directly at the Sun during an eclipse and this is can cause permanent damage to your eyesight. Never look directly at the Sun with the naked eye or through any optical device (e.g. - camera, binoculars or telescope). There are a several types of Solar Filters designed specifically for Sun viewing which are available from a number of filter manufacturers and distributors. You can also use the pinhole projection method to safely watch the eclipse.

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Web site: http://sunearth.gsfc.nasa.gov/eclipse/extra/PSE2000Dec25.html

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The diagram above shows what the 2000 Dec 25 solar eclipse will look like from Washington DC. The times of the start, maximum and end of the eclipse are given for Eastern Standard Time.
Eclipse times and diagrams for many other cities are found in the links below. What will the eclipse look like and when does it begin and end? That all depends on your city or geographic location. You can see a graphic preview for a number of cities by visiting one of several special web pages and graphics prepared for the Christmas Eclipse 2000. Just got to the table for your country of geographic area, find your city in the table and click on it to see an eclipse diagram:

Partial Eclipse From the USA!

Partial Eclipse From the Canada!

Partial Eclipse From Mexico, Central America & Caribbean!
Each of the above links takes you to a table of cities listed in alphabetical order (by state in the USA). The table gives a brief summary of the eclipse circumstances as seen at each city and includes the times of start, maximum and end of the eclipse, the magnitude, the altitude of the Sun and the duration of the eclipse. As you click on the name of each city, you will see a figure illustrating the eclipse's appearance at maximum eclipse. A brief table lists the the eclipse times as well as other details about the eclipse.

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See Website:

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Phases of the total solar eclipse 1994 Nov 03. Courtesy of MrEclipse.com.
An eclipse of the Sun presents a tempting target to photograph. Fortunately, solar eclipse photography is easy provided that you have the right equipment and use it correctly. For examples of photographs taken during previous solar eclipses, please visit the Solar Eclipse Gallery. Please remembr that you should never look directly at the Sun without practicing Safe Eclipse Viewing Techniques and/or use an approved solar filter!

The NASA Five Millennium Catalog of Solar Eclipses lists the date and circumstances for every eclipse from 2,000 BC through 3,000 AD. Searching the catalog reveals that there are 31 solar eclipses which occur on December 25. Most are partial, some are annular, and there are a few total or hybrid (total in one small area and annular elsewhere). A partial eclipse means only part of the Sun is covered by the Moon. A total eclipse finds the Moon covering the entire disk of the Sun along a narrow path across the Earth. During an annular eclipse, the Moon is too far away to completely cover the Sun. A thin ring of the Sun's disk is then seen to surround the Moon.

The last solar eclipse on December 25 was in 1954. It was an

annular eclipse seen in the southern hemisphere over Africa. The next solar eclipse on December 25th occurs in 2307. It will be a partial eclipse visible off the western coast of Africa. There are two December 25 eclipses in the twenty-fourth century: 2326 and 2383. The second eclipse will be seen from the northern hemisphere. The last total eclipse of the Sun on December 25 was in the year 1666 over South America. The next total eclipse of the Sun on Dec. 25 will be in 2755 in Europe. (Special thanks to Jack Dunn - Mueller Planetarium - Un. of Nebr. State Museum for researching the topic of December 25 eclipses using the NASA 5,000 Solar Eclipse Catalog.)

Eclipse Frequency and Future Eclipses
The NASA Five Millennium Catalog of Solar Eclipses lists the date and circumstances for every eclipse from 2,000 BC through 3,000 AD. During this period, there are 11,897 eclipses of the Sun (including partial, annular and total). Slightly more than one third of these are partial eclipses, on third are annular eclipses and just over one quarter are total eclipses.
There are at least two solar eclipses every year although they may both be partial eclipses. On exrtremely rare occassions, there can be as many as five solar eclipses in one calendar year (e.g. - 1936 and 2207).

The table below lists every solar eclipse from 2000 through 2002. Click on the eclipse Date to see a map of an eclipse. Click on the Region of Eclipse Visibility to see a detailed description of an eclipse.

The Eclipse Magnitude is the fraction on the Sun's diameter obscurred at maximum eclipse. For values greater than 1.0, it is a total eclipse. For values less than 1.0, it is either a partial or annular eclipse. The Center Duration is the duration of either the total or annular phase (if any).

Date Eclipse
Type Eclipse
Magnitude Central
Duration Geographic Region of Eclipse Visibility
2000 Feb 5 Partial 0.579 - Antarctica
2000 Jul 01 Partial 0.477 - S Pacific Ocean, s South America
2000 Jul 31 Partial 0.603 - n Asia, nw North America
2000 Dec 25 Partial 0.723 - North & Central America
2001 Jun 21 Total 1.050 04m57s e S. America, Africa
[Total: s Atlantic, s Africa, Madagascar]
2001 Dec 14 Annular 0.968 03m53s N. & C. America, nw S. America
[Annular: c Pacific, Costa Rica]
2002 Jun 10 Annular 0.996 00m23s e Asia, Australia, w N. America
[Annular: n Pacific, w Mexico]
2002 Dec 04 Total 1.024 02m04s s Africa, Antarctica, Indonesia, Australia
[Total: s Africa, s Indian, s Australia]

Live Web Coverage of the Eclipse
We will list links for live web coverage of the eclipse as they become available.
High Moon Webcast - Olivier Staiger.

Web Resources
More on December's eclipse: sunearth.gsfc.nasa.gov/eclipse/OH/OH2000.html
Solar Eclipses from 1991 to 2000: sunearth.gsfc.nasa.gov/eclipse/SEcat/SEbrief1.html
Solar Eclipses from 2001 to 2010: sunearth.gsfc.nasa.gov/eclipse/SEcat/SEbrief2.html
5,000 Year Catalog of Solar Eclipses: sunearth.gsfc.nasa.gov/eclipse/SEcat/SEcatalog.html
Tips on Photographing Solar Eclipses: www.mreclipse.com/Totality/TotalityCh12-1.html
Gallery of Solar Eclipse Photographs: www.mreclipse.com/SEgallery/SEgallery1.html

References
Espenak, F., 1987, Fifty Year Canon of Solar Eclipses: 1986-2035, Sky Publishing Corp., Cambridge, MA.
Espenak, F., 1999, "Eclipses During 2000", Observer's Handbook - 2000, Royal Astronomical Society of Canada, Toronto, Ontario.

All eclipse calculations are by Fred Espenak, and he assumes full responsibility for their accuracy. Some of the information presented in this catalog is based on data originally published in Fifty Year Canon of Solar Eclipses: 1986 - 2035.


Special thanks to Summer Intern Megan O'Grady for her valuable assistance in preparing this web page.

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e-mail: espenak@gsfc.nasa.gov
NASA/Goddard Space Flight Center, Greenbelt, Maryland 20771 USA

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# Comet Headlines

Credit: JPL, NASA

***Last Updated: 5 December 2000***

## 73P/Schwassmann-Wachmann 3 has three parts

IAUC 7534 (December 2, 2000) reports that 73P/Schwassmann-Wachmann 3 has three nucleus components...Two from the break-up in 1995

***(continued on page 6, left column, at bottom)***
**(*Comets continued*)**

## The Circinus Galaxy

Credit: Andrew S. Wilson (U. Maryland) et al., WFPC2, HST, NASA

Explanation: Powerful forces are at play in the nearby Circinus Galaxy. Hot gas, colored pink, is being ejected out of the spiral galaxy from the central region. Much of Circinus' tumultuous gas, however, is concentrated in two rings. The outer ring, located about 700 light-years from the center, appears mostly red and is home to tremendous bursts of star formation. A previously unseen inner ring, inside the green disk above, is visible only 130 light years from the center on this recently released, representative color image taken by the Hubble Space Telescope. At the very center is an active galactic nucleus, where matter glows brightly before likely spiraling into a massive black hole. Although only 15 million light years distant, the Circinus Galaxy went unnoticed until 25 years ago because it is so obscured by material in the plane of our own Galaxy. The galaxy can be seen with a small telescope, however, in the constellation of Circinus.

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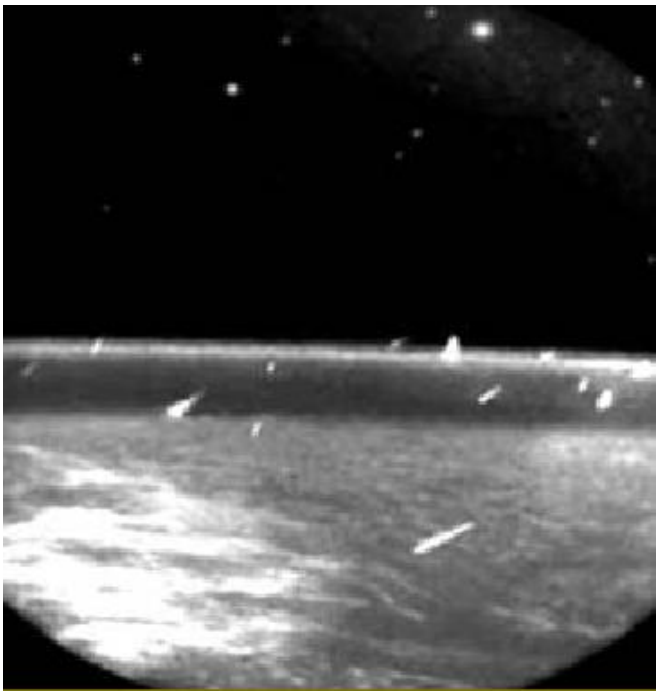
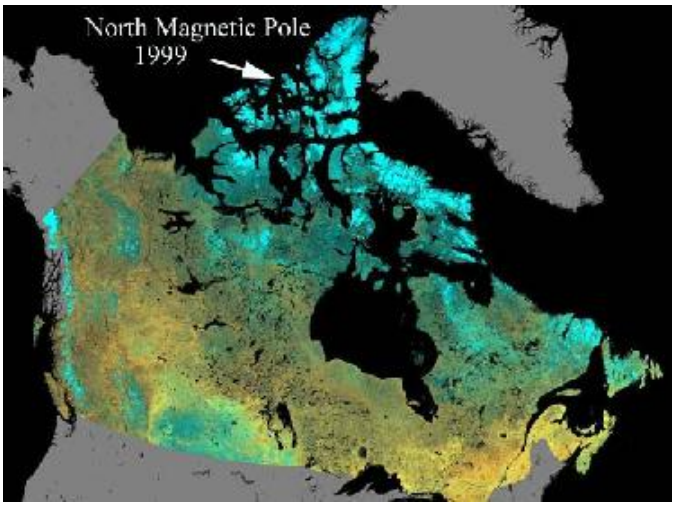
## Leonids from Orbit

Credit: P. Jenniskens (NASA/Ames, SETI Inst.) et al., APL, UVISI, MSX, BMDO

Explanation: Here is what a meteor shower looks like from orbit. During the peak of the 1997 Leonid Meteor Shower, the MSX satellite imaged from above 29 meteors over a 48 minute period entering the Earth's atmosphere. From above, meteors create short bright streaks. Visible beneath the meteors are clouds lit by reflected moonlight, while visible above is the constellation of Aries. The directions of the meteor streaks are nearly parallel, confirming that the meteors all originate from the same meteor stream. Recent analysis of the 2000 Leonids meteor shower indicates to many astronomers that the 2001 Leonids may develop into a real meteor storm, with meteor rates perhaps exceeding one per second visible from parts of Asia.



**Leonids from Orbit**




**Earth's North Magnetic Pole** Credit: NOAA

Explanation: A magnetic compass does not point toward the true North Pole of the Earth. Rather, it more closely points toward the North Magnetic Pole of the Earth. The North Magnetic Pole is currently located in northern Canada. It wanders in an elliptical path each day, and moves, on the average, more than forty meters northward each day. Evidence indicates that the North Magnetic Pole has wandered over much of the Earth's surface in the 4.5 billion years since the Earth formed. The Earth's magnetic field is created by Earth's partially ionized outer core, which rotates more rapidly than the Earth's surface. Indicated in the above picture is Ellef Ringnes Island, the current location of Earth's North Magnetic Pole.

Palomar 13's Last Stand
Credit: M. Siegel & S. Majewski (UVA), C. Gallart (Yale), K. Cudworth (Yerkes), M. Takamiya (Gemini), Las Campanas Observatory

Explanation: Globular star cluster Palomar 13 has roamed the halo of our Milky Way Galaxy for the last 12 billion years. The apparently sparse cluster of stars just left of center in this composite color digital image, it is one of the smallest, faintest globular clusters known. (The bright foreground star near bottom is unrelated and creates the spiky imaging artifacts.) Observations spanning forty years indicate that Palomar 13's galactic halo orbit is a highly eccentric one which, every one or two billion years, brings it relatively close to the galactic center. With each close approach to the Milky Way's central regions, gravitational tidal forces strip away the delicately bound cluster stars. In fact, detailed present day studies offer evidence for a dramatic end to this dwindling cluster's tidal tug of war. Palomar 13's latest close approach was only about 70 million years ago. But, when Palomar 13 again approaches the galaxy, it could well turn out to be the cluster's last stand.

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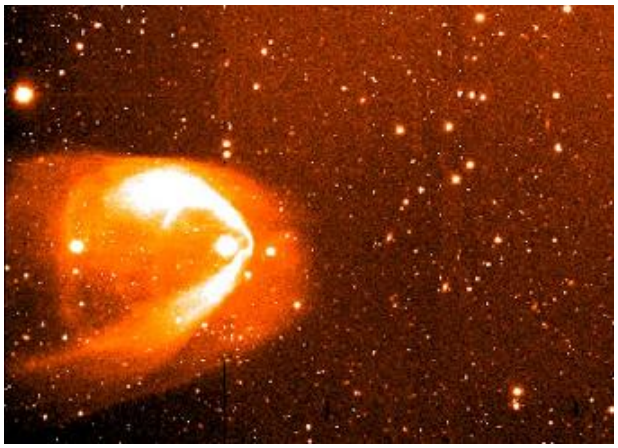
BZ Cam Bow Shock Credit: R. Casalegno, C. Conselice et al., WIYN, NOAO, MURST, NSF

Explanation: BZ Cam is a binary star system that is not well understood. In most cataclysmic variables, matter from a normal star accumulates on the surface of the companion white dwarf star, eventually causing a nova-like flare as the material becomes hot enough to ignite nuclear fusion. In BZ Cam, however, light appears to flicker unpredictably, and an unusually large wind of particles is being expelled. Pictured above, BZ Cam's wind creates a large bow-shock as the system moves through surrounding interstellar gas. BZ Cam lies about 2500 light-years away toward the constellation of Camelopardalis.



BZ Cam Bow Shock

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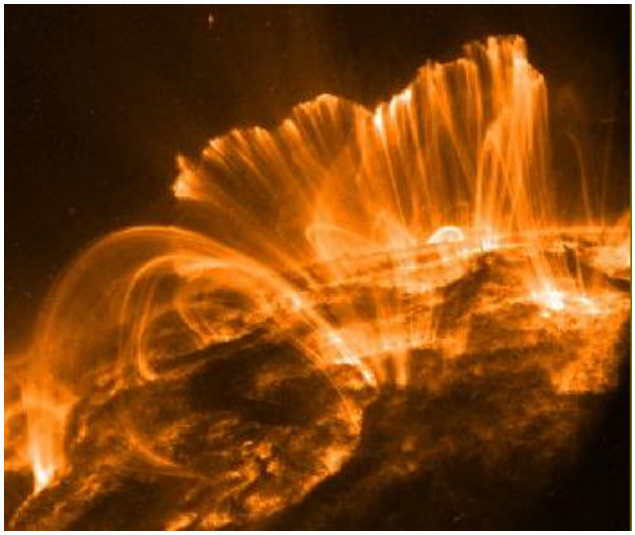


Coronal Rain, Solar Storm
Credit: TRACE Project, NASA

Explanation: In this picture, the Sun's surface is quite dark. A frame from a movie recorded on November 9th by the orbiting TRACE telescope, it shows coronal loops lofted over a solar active region. Glowing brightly in extreme ultraviolet light, the hot plasma entrained above the Sun along arching magnetic fields is cooling and raining back down on the solar surface. Hours earlier, on November 8th, astronomers had watched this particular active region produce a not so spectacular solar flare. Still, the M-class flare spewed forth an intense storm of particles, suddenly showering satellites near the Earth with high energy protons. The flare event was also associated with a large coronal mass ejection, a massive cloud of material which impacted our fair planet's magnetic field about 31 hours later. The result ... a strong geomagnetic storm.

Manicouagan Impact Crater on Earth
Credit: STS-9 Crew, NASA

Explanation: The Manicouagan Crater in northern Canada is one of the oldest impact craters known. Formed during a surely tremendous impact about 200 million years ago, the present day terrain supports a 70-kilometer diameter hydroelectric reservoir in the telltale form of an annular lake. The crater itself has been worn away by the passing of glaciers and other erosional processes. Still, the hard rock at the impact site has preserved much of the complex impact structure and so allows scientists a leading case to help understand large impact features on Earth and other Solar System bodies. Also visible above is the vertical fin of the Space Shuttle Columbia from which the picture was taken in 1983.

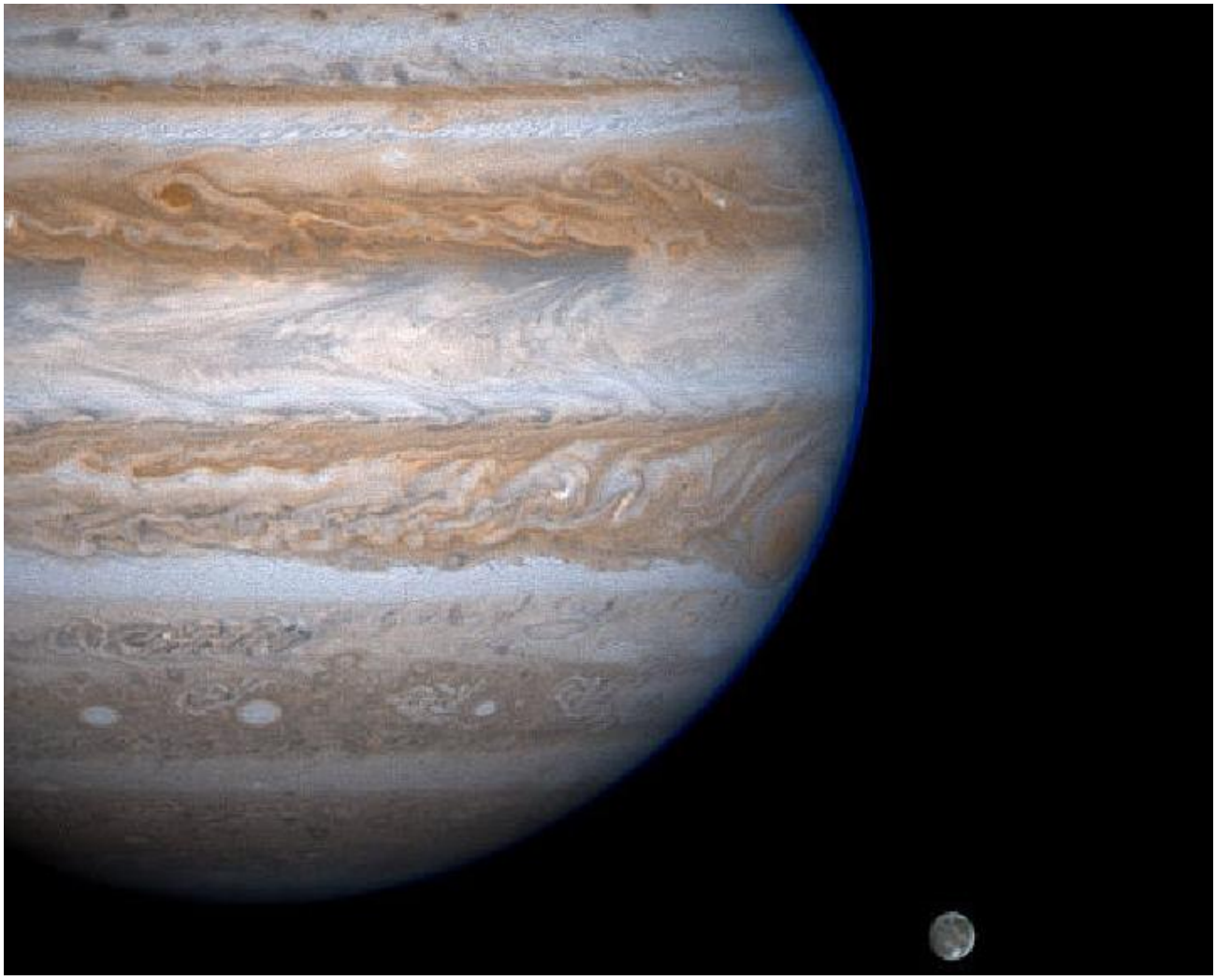
(Components B and C) and a new one Component E) that just broke off. Components B and E are 2.5-2 and 1.5-2 magnitudes, respectively, fainter than the assumed primary component C. Observations of the component E were made by K. Kadota (Ageo, Japan, 0.18-m reflector + CCD) and M. Jaeger (Puchenstuben, Austria, 0.3-m reflector + Technical Pan film). Jaeger also observed component B. Earlier observations of component B were made by A. Galad and P. Koleny (Modra, 0.6-m reflector + CCD). Only component C has been seen visually.

### Bright New Southern Hemisphere Comet (Updated)

IAUC 7526 (November 26, 2000) announced the discovery of COMET C/2000 W1 (UTSUNOMIYA-JONES) at 8th magnitude. This is an unusual discovery for several reasons...first and foremost, LINEAR or some other automated system failed to find it...giving hope that a few comets will acutally have the names of people associated with them. Second, this comet was moving so fast that after it was discovered by Syogo Utsunomiya (Japan) on the

**(*continued on page 8*)**

(***Comets continued***)



Jupiter Eyes Ganymede
Credit: Cassini Imaging Team, Cassini Project, NASA

Explanation: Who keeps an eye on the largest moon in the Solar System? This moon, visible on the lower right, is Ganymede, and the planet it orbits, Jupiter, seems to be keeping a watchful eye, as its Great Red Spot appears serendipitously nearby. This recently released enhanced-contrast image from the robot spacecraft Cassini captures new details of the incredible intricacies of
Jupiter's complex cloud patterns. Features as small as 250 kilo meters can be seen. Counter-clockwise rotating high-pressure white ovals that are similar to the Great Red Spot appear in the red band below the spot. Between these spots are darker low-pressure systems that rotate clockwise. The hydrogen and helium that compose most of Jupiter's clouds is nearly invisible -
the trace chemicals that give Jupiter these colors remain unknown. The Cassini spacecraft is using Jupiter to pull it toward
Saturn, where it is scheduled to arrive in 2004.

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## ESO Press Release 8 December 2000

*The most massive spiral **galaxy known so far in the Universe** has been discovered by a team of astronomers from Garching, Padova, Leiden, ESO and London [1]. They base their conclusion on recent observations with **ISAAC**, an infrared-sensitive, multi-mode instrument on ESO's Very Large Telescope at the Paranal Observatory.*

*This galaxy has been designated **ISOHDFS 27** and is located at a distance of approx. 6 billion light-years (the redshift is 0.58). Its measured mass is more than 1000 billion times that of the Sun [2]. It is thus about four times more massive than our own galaxy, the Milky Way, and twice as heavy as the heaviest spiral galaxy known so far.*
*The determination of the mass of **ISOHDFS 27** is based on a unique measurement of the motions of its stars and nebulae around the center. The faster the motion is, the greater is the mass. It is, in essence, the same method that allows determining the mass of the Earth from the orbital speed and distance of the Moon.*
*This is the first time a "rotation curve" has been observed in such a distant galaxy by means of infrared observations, allowing a very detailed dynamical study. Other observations by the team concern a pair of distant, interacting galaxies that were also found to possess comparably high masses. They also have observations of a third galaxy at a distance of about 10 billion light-years, with a mass that approaches that of **ISOHDFS 27**.*
***The new result has important cosmological implications, as it demonstrates that very heavy structures had already been formed in the Universe at a comparatively early epoch**.*

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18th of November, a number of attempts to confirm the discovery were unsuccessful. The comet was independently discovered by Albert F. Jones (Nelson, New Zealand, 0.078-m f/8 refractor, 30x) while observing the variable star T Aps. Jones, a well-known comet observer, may be, at 80 years old, the oldest comet discoverer on record. Mr. Jones also discovered a comet in 1946!
An orbit given on MPEC 2000-W62 gives the perihelion date as December 26.56 with a perihelion distance of 0.32 AU. The comet has reached its southern most declination (~-77) and will be heading northward, but with a decreasing elongation from the Sun. The comet is currently about 6.5-7.2 magnitude and is expected to not change in brightness much into early December when the comet is more than 30 degrees elongation from the Sun. Just prior to perihelion, 2000 W1 may peak at magnitude ~6.0., the comet will be less than 20 degrees from the Sun at that point. By the time that the comet emerges from solar conjunction in mid-January, 2001, it will have faded to 9th-10th magnitude.

# Lowbrow Schedule for 2001

Bernard Friberg

Public open house schedule at Peach Mountain:
1/20, 1/27, 2/17, 2/24, 3/17, 3/24, 4/21, 4/28, 5/19, 5/26, 6/16, 6/23, 7/14, 7/21, 8/11, 8/18, 9/15, 9/22, 10/13, 10/20, 11/10, 11/17, 12/8, 12/15

Lowbrow meetings at Dennison:
1/19, 2/16, 3/16, 4/20, 5/18, 6/15, 7/20, 8/17, 9/21, 10/19, 11/16, 12/21
Lowbrow's at the Leslie Science Center in Ann Arbor:
August 24

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## Scope for Sale

I am selling my Meade LX200 10" Schmidt-Cassegrain. Included is a focal reducer, extra eyepiece, dew shield, narrow band filter. Asking price is $3,000. E-mail inquires to lynchchristopher@peoplepc.com or call 662-4026. Thank You; Christopher Lynch.

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(*Comets continued*)

### Two Faint Comets Unexpectedly Bright

Both 41P/Tuttle-Giacobini-Kresak and 73P/Schwassmann-Wachmann 3 are unexpectly bright.

**Observations:**

41P/Tuttle-Giacobini-Kresak
2000 Nov. 27.53: m1=10.2:, Dia.=3', DC=4, ... 41 cm L ... Alan Hale (Cloudcroft, New Mexico) [comet clearly in outburst; bright and easy object]
2000 Dec. 6.52: m1=11.4, Dia.=2', DC=2, ... 41 cm reflector ... Alan Hale (Cloudcroft, New Mexico) [the comet is clearly fainter than a week ago, and also appears to be more diffuse. The apparent outburst this comet has had appears to be subsiding]

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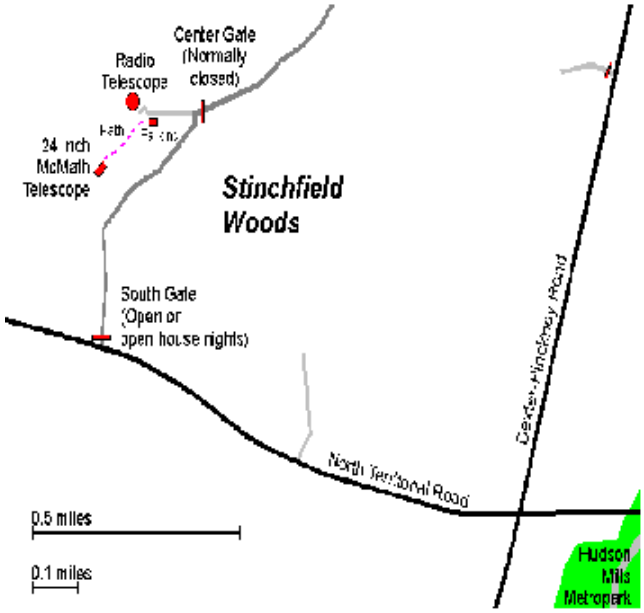
# Merry Christmas and Happy New Year to Everyone

## Places and Times:

Dennison Hall, also known as The University of Michigan's Physics and Astronomy building, is the site of the monthly meeting of the University Lowbrow Astronomers. It is found in Ann Arbor on Church Street about one block north of South University Avenue. The meeting is held in room 130. Monthly meetings of the Lowbrows are held on the 3rd Friday of each month at 7:30 PM. During the summer months, and when weather permits, a club observing session at Peach Mountain will follow the meeting.




Peach Mountain Observatory is the home of The University of Michigan's 25 meter radio telescope as well as the University's McMath 24 inch telescope which is maintained by the Lowbrows. The observatory is located northwest of Dexter. The entrance is on North Territorial Road, 1.1 miles west of Dexter-Pickney Road. A small maize-and-blue sign marks the gate. Follow the gravel road one mile to a parking area near the radio telescopes. Walk along the path between the two fenced in areas (about 300 feet) to reach the McMath telescope building.

## Public Star Parties:

Public Open House/Star Parties are held on the Saturday before and after each new Moon at the Peach Mountain Observatory. Star Parties are canceled if the sky is cloudy at sunset or the temperature is below 10 degrees F. Call 480-4514 for a recorded message on the afternoon of a scheduled Star Party to check on the status. Many members bring their telescopes and visitors are welcome to do likewise. Peach Mountain is home to millions of hungry mosquitoes - bring insect repellent, and it does get cold at night so dress warmly!

Amateur Telescope Making Group meets monthly, with the location rotating among member's houses. See the calendar on the front cover page for the time and location of next meeting.

## Membership:

Membership dues in the University Lowbrow Astronomers are $20 per year for individuals or families, and $12 per year for students and seniors (age 55/+). This entitles you to the monthly REFLECTIONS newsletter and the use of the 24" McMath telescope (after some training). Dues can be paid to the club treasurer Charlie Nielsen at the monthly meeting or by mail at this address:

6655 Jackson Road #415
Ann Arbor, MI 48103

## Magazines:

Members of the University Lowbrow Astronomers can get a discount on these magazine subscriptions:

Sky and Telescope: $29.95 / year
Astronomy: $29.00 / year

For more information contact the club Treasurer. Members renewing subscriptions are reminded to send your renewal notice along with your check when applying through the club Treasurer. Make the check payable to "University Lowbrow Astronomers".

## Newsletter Contributions:

Members and (non-members) are encouraged to write about any astronomy related topic of interest. Call or E-mail to Newsletter Editors at:

Bernard Friberg (743)761-1875 Bfriberg@aol.com
Chris Sarnecki (734)426-5772 chrisandi@aol.com

to discuss length and format. Announcements and articles are due by the first Friday of each month.

## Telephone Numbers:

| | | |
|---|---|---|
| President: | Mark Deprest | (734)662-5719 |
| Vice Presidents: | Dave Snyder | (734)747-6537 |
| | Paul Walkowski | (734)662-0145 |
| | Doug Warshow | (734)998-1158 |
| Treasurer: | Charlie Nielsen | (734)747-6585 |
| Observatory Director: | Bernard Friberg | (734)761-1875 |
| Newsletter Editors: | Chris Sarnecki | (734)426-5772 |
| | Bernard Friberg | (734)761-1875 |
| Parking Enforcement | Lorna Simmons | (734)525-5731 |
| Keyholders: | Fred Schebor | (734)426-2363 |
| | Mark Deprest | (734)662-5719 |

## Lowbrow's Home Page:

http://www.astro.lsa.umich.edu/lowbrows.html
Dave Snyder, webmaster

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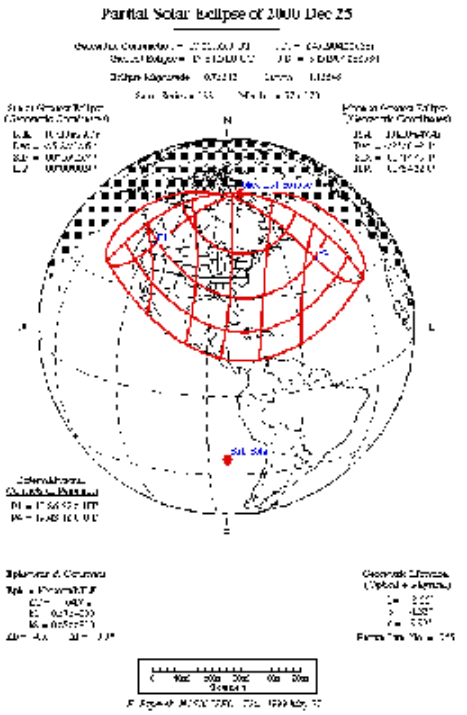
(This newsletter assembled and items selected by BF)

**Monthly Meeting**
**December 15th, 7:30 pm**
Room 130 Dennison Hall
Physics & Astronomy Building
The University of Michigan

# 'Variable Cataclysmic Stars' presented by Mike Simonsen AAVSO Warren Astronomical Society




UNIVERSITY LOWBROW
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