



The Observer

A Publication of The Cuyahoga Astronomical Association
PO Box 868, North Olmsted, OH 44070

CAA Schedule

Monday, December 13

Annual Membership Christmas Party at 7 p.m. at the U.S. Coast Guard Club. The U.S. Coast Guard Club is located at 1055 E 9th Street in downtown Cleveland, just north of the Shoreway (Route 2). Please note that the party is at the Coast Guard Club, **NOT** the Coast Guard Station. Plan on attending and bring a few pictures to share. Mike Schwab will give a short talk about the star of Bethlehem, as reconstructed by historical astronomers. He will then moderate a discussion involving additional questions and comments from the audience

Sunday, January 12

Monthly Board Meeting will be held at 4 p.m. in Cupachino's Café at 23420 Lorain Road, North Olmsted. That's at the corner of Clague and Lorain Roads.

Monday, January 13

General Membership Meeting at 8 p.m. in the Lake Erie Nature and Science Center in Huntington Reservation. Al Panzer will present "Sunspot Cycles and Aurora Borealis".

Upcoming Astronomical Events

Thursday, December 2

7 p.m. EST: Pluto is in conjunction with the sun.

8 p.m. EST: Mercury is at greatest western elongation (20 degrees, morning).

Friday, December 3

4 p.m. EST: The moon passes 3 degrees north of Venus.

Sunday, December 5

8 p.m. EST: The moon passes 3 degrees north of Mercury.

Saturday, December 11

5 p.m. EST: The moon passes 0.07 degree north of Neptune.

Sunday, December 12

2 p.m. EST: The moon passes 0.6 degree north of Mars.

4 p.m. EST: The moon passes 0.2 degree north of Uranus.

Monday, December 13

Midnight EST: Mars passes 0.7 degree south of Uranus.

Tuesday, December 14

Geminid meteor shower peaks.

Thursday, December 16

8 p.m. at the Cleveland Museum of Natural History in Murch Auditorium.

"Finding New Planets Around Nearby Stars" will be presented by Dr. Glenn Starkman from Case Western Reserve University. This is the second of five free public lectures in the Frontiers of Astronomy series. No tickets or reservations are required. On clear evenings, the Museum's observatory will be open following the lectures.

Do Earth-like planets exist around other stars? While astronomers have had great success discovering Jupiter-like planets orbiting close to other stars by watching those stars wobble – pictures of any planets outside our own solar system have yet to be taken. The problem is not that the planets are too dim, or that we don't know where to look, but rather the stars they orbit are too bright. Dr. Glenn Starkman

discusses how the use of a large steerable satellite would allow pictures to be taken of nearby Earth-like planets by the end of the next decade.

Friday, December 17

3 a.m. EST: Mercury passes 5 degrees north of Antares.

Saturday, December 18

1 a.m. EST: The moon passes 4 degrees south of Jupiter.

Sunday, December 19

4 a.m. EST: The moon passes 3 degrees south of Saturn.

Tuesday, December 21

4 a.m. EST: The moon passes 1.3 degrees north of Aldebaran.

Wednesday, December 22

3 a.m. EST: Solstice (northern winter/southern summer begins).

Tuesday, December 28

3 p.m. EST: Juno is in conjunction with the sun.

Sunday, January 2

11 p.m. EST: The moon passes 3° north of Venus.

Tuesday, January 4

Quadrantid meteor shower peaks.

Monday, January 10

2 p.m. EST: The moon passes 1.9° south of Mars.

Saturday, January 15

Noon EST: The moon passes 3° south of Saturn.

8 p.m. EST: Mercury is in superior conjunction.

Monday, January 17

3 p.m. EST: The moon passes 1.2° north of Aldebaran.

Thursday, January 20

Midnight EST: Total lunar eclipse.

Monday, January 24

1 p.m. EST: Neptune is in conjunction with the sun.

Wednesday, January 26

10 p.m. EST: Pallas is at opposition.

News

Dues Again Again Again

It's time to remind you to renew your membership with us. Your membership will expire at the end of this year, so here's an encouragement, one more time.

Remember that we offer you the exceptional opportunity to renew existing magazine subscriptions at a large discount. You can also purchase one of the best observing handbooks printed, *The Observer's Handbook* by The Royal Astronomical Society of Canada, at a goodly discount, as well.

To renew a subscription of a magazine, get your old issues out and copy down your subscription number or copy it off the plastic bag from next month's issue. Be sure to include your subscription number so you won't be seen as a new subscriber. To take advantage of this discount plan you must have your dues form in early with the subscription number and, of course, the money.

We are also asking for email addresses on the subscription form. This collection of information will allow us to begin to enter the 20th century and build better information services for our members.

If you don't want your phone number or e-mail address published in the membership directory, please indicate that as well.

Seen About Town

Al Panzer, one of our members, is also a member of the Lake Erie Amateur Radio Association. Back in October, Al presented a program focusing on how the solar system, primarily the Sun, effects radio communications. He also talked about tracking Sunspot activity in both intensity and density.

Huge Fireball Dazzles Midwest

NASA Space Science News, November 17, 1999

A brilliant fireball attracted stares across the eastern U.S. Tuesday night. On an Illinois highway east of Chicago, traffic slowed to a crawl as motorists peered at an extraordinary fireball blazing overhead. "It was one of the most beautiful meteors I have ever seen," said Jamie Dresser, who was driving home from work just after 6 pm CST. "It was so bright that it lit up the sky for quite a distance. There was a blue corona ... and it was actually trailing fire for quite a distance. I sincerely look forward to driving home the next few nights!"

Hundreds of reports like this one are pouring in from all over the mid western United States. Thousands of commuters and star gazers saw what astronomers call an "Earth grazer" -- a meteoroid or piece of space debris that travels nearly parallel to Earth's surface as it disintegrates in our atmosphere. Earth grazers are slow moving and feature vibrant colors in long beautiful tails. This one was spotted between 5:50 and 6:05 CST as it sped over Wisconsin, Michigan, Illinois, Ohio, Kentucky, New York and several other states.

Tuesday night's fireball was so bright that it was first noticed by many observers while they were inside brightly lit buildings. "I was sitting in a Wendy's facing outside and saw the bright orange light in the sky," recounts Wendi S. Abbott of Cincinnati, OH. "I have no idea how long it lasted, but I had time to jump up, race over to the window and ask the family sitting there if they were seeing what I was

seeing. The father said it was just a reflection in the window, but quickly changed his mind. It finally broke apart in about 3 or 4 pieces before it died out. What an incredible sight!"

The trajectory of the fireball was similar in appearance to an aircraft, flying low and level to the horizon from west to east. Many observers reported seeing the meteor fragment into many iridescent pieces that traveled in a line like a string of Christmas lights.

It may seem surprising that Tuesday's fireball was probably not a Leonid. Leonid meteors emanate from a point in the sky within the constellation Leo, which rises above the eastern horizon around midnight. At the time of the fireball sighting Leo was about 35 degrees below the northern horizon, which means that Leonid Earth-skimmers appearing over the horizon would travel roughly north to south. Most observers reported that the November 16 fireball moved west to east. While it is possible that this meteoroid was a part of the debris stream of comet Tempel-Tuttle (the parent of the Leonids), it is far more likely to be an unrelated, sporadic meteor or perhaps a piece of "space junk" decaying from low-Earth orbit.

Editor's Note: I took my telescope to my son's cub scout meeting that evening and showed the kids Jupiter, Saturn, and the moon. My wife and daughter were also with me. While I was showing the kids the planets, my daughter started yelling "Dad! Dad! Look!" Well, what we saw was the most incredible sight I have ever seen. We saw a bright fireball, moving from west to east. It broke up into many pieces, I'm guessing around 4 or 5, and these 4 or 5 pieces streaked all the way across the sky like a freight train, to the horizon. You could actually see fire trailing from it. It must have lasted about 20 - 25 seconds. It reminded me of the talk Clyde gave us about meteors. It looked a lot like the footage that Clyde showed us. It was just awesome! We saw this a little after 7 pm. Talk about being in the right place at the right time. I hope some of you

were fortunate enough to see this fire-ball as my family and I were.

It's Real! By observing the transit of a planet across the face of a distant star, astronomers prove that planets exist outside our solar system.

NASA Space Science News, November 14, 1999. BASED ON A UNIVERSITY OF CALIFORNIA BERKELEY PRESS RELEASE.

Last Friday, a team led by Greg Henry (Tenn. State) and Geoff Marcy (UC Berkeley) announced the discovery of a shadow of a planet crossing a distant star. Little known HD 209458, a Sun-like star 150 light-years away, had been suspected harboring planets from a slight wobble found in its motion. Henry et al. now find that this wobble exactly corresponds to a planet crossing the face of the star, creating the slight dimming effect of a partial eclipse. The astronomers were then able to make a ground breaking estimate of the mass and radius of the extra-solar planet, which they find to have about two-thirds the mass of Jupiter but about 60 percent larger radius.

"This is the first independent confirmation of a planet discovered through changes in a star's radial velocity and demonstrates that our indirect evidence for planets really is due to planets," said Geoffrey Marcy, a professor of astronomy at the University of California, Berkeley. Marcy and his colleagues, Paul Butler of the Department of Terrestrial Magnetism at the Carnegie Institution of Washington in Washington, D.C., and Steve Vogt of UC Santa Cruz and Lick Observatory, first detected a wobble in the star called

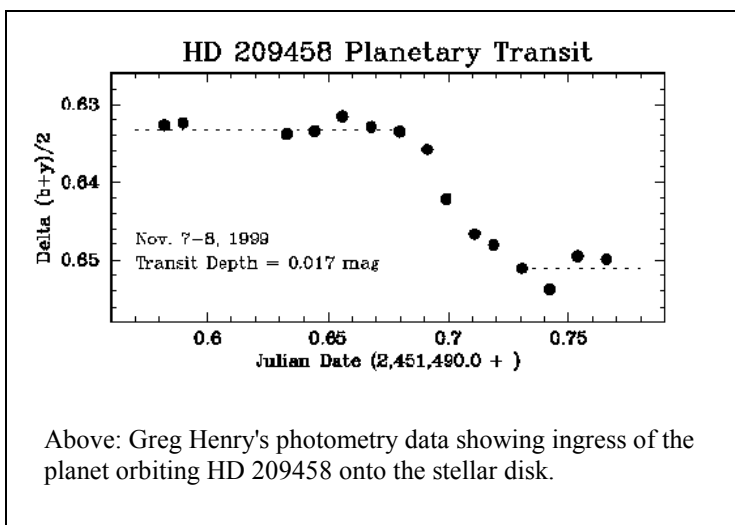
HD 209458 on Nov. 5. Ascribing the wobble to a nearby planet, they were able to estimate its orbit and approximate mass.

As with all new planets they detect, the team immediately brought it to the attention of collaborator Greg Henry, an astronomer at the Tennessee State University Center of Excellence in Information Systems in Nashville. He conducts research with several automatic telescopes at Fairborn Observatory, a non-profit research foundation located in the Patagonia Mountains of southern Arizona.

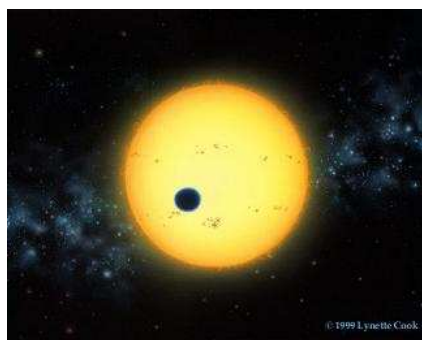
Henry turned one of his automatic telescopes on the star at the time Marcy and Butler predicted the planet would cross the face of the star if the planet's orbital plane were lucky enough to carry it between Earth and the star. Until now, none of the 18 other extrasolar planets Marcy and Butler have discovered has had its orbital plane oriented edge-on to Earth so that the planet could be seen to transit the star, nor have any of the other planets discovered by other researchers.

However, on Nov. 7, Henry observed a 1.7 percent dip in the star's brightness. Because the planet orbits its star once every 3.523 days, he plans to repeat his observations on Sunday, Nov. 14.

"This planetary transit occurred at exactly the time predicted from Marcy's observations, confirming absolutely the presence of a companion," Henry said. "The amount of dimming



Above: Greg Henry's photometry data showing ingress of the planet orbiting HD 209458 onto the stellar disk.



Above: Artist Lynette Cook's depiction of a planetary eclipse in the HD 209458 system. Copyright 1999, Lynette Cook, all rights reserved.

of the star's light during the transit also gives us the first-ever measure of the size and density of an extrasolar planet. We've essentially seen the shadow of the planet and used it to measure the planet's size."

Quoting from IAU Circular #7307 (11-12-99): "G.W.Henry, Tennessee State University, G.Marcy, U.C. Berkeley, R.P.Butler, Dept. of Terrestrial Magnetism, and S.S.Vogt, UCO Lick Observatory report that HD 209458 (G0V) exhibits sinusoidal velocity variations with semi-amplitude of 81 m/s, indicating presence of a companion with $M_{\text{sin}} = 0.63$ Jupiter masses and an orbital period of 3.523 d. Photometry reveals a transit ingress at JD 2451490.70 with depth of 0.017 mag, consistent with the transit time predicted from the velocities. Further measurements of transits and velocities would be valuable. The next three predicted times of ingress occur at UT times: 15 Nov 6:19, 18 Nov 18:53, 22 Nov 7:28, all times uncertain by 1 hour. If correct, the inferred mass is 0.63 M_{Jup} and radius is 1.6 R_{Jup} , implying a density of 0.21 g/cc."

The star HD 209458 is 47 parsecs (153 light years or 1.4 million billion kilometers or 895,000 billion miles) away in the constellation of Pegasus, and is about the same age, color and size as our own Sun. It is very near the star, 51 Pegasi, around which the first extrasolar planet was discovered in 1995.

With the orbital plane of the planet known, the astronomers for the first time could determine precisely the mass of the planet and, from the size of the planet measured during transit, its density.

Interestingly, while the planet's mass is only 63 percent of Jupiter's mass, its radius is 60 bigger than that of Jupiter. This fits with theories that predict a bloated planet when, as here, the planet is very close to the star.

The density, about 0.2 grams per cubic centimeter, means it is a gas giant like Jupiter. However, such gas giants could not have formed at the distance this planet is from its star. "This supports the theory that extrasolar planets very near their star did not form where they are, but formed farther out and migrated inward," Henry said.

Various groups around the world have been searching for planets by looking for dimming of stars, or as Marcy says, "staring at the sky and seeing if any star blinks." To date, none of these searches has turned up a new planet. "With this one, everything hangs together," Marcy said. "This is what we've been waiting for."

The research described in this article was supported by the National Aeronautics and Space Administration, the National Science Foundation, Sun Microsystems and the Richard Lounsbery Foundation.

Mars Polar Lander closing in on Mars

MEDIA RELATIONS OFFICE,
JET PROPULSION LABORATORY,
CALIFORNIA INSTITUTE OF
TECHNOLOGY, NATIONAL
AERONAUTICS AND SPACE AD-
MINISTRATION, PASADENA,
CALIF. November 30, 1999

Flight controllers at NASA's Jet Propulsion Laboratory, Pasadena, Calif., report that the Mars Polar Lander spacecraft is in excellent health as it prepares for its arrival at the red planet on Friday.

This morning at about 10 a.m. Pacific time, the spacecraft performed a fourth scheduled maneuver to adjust



its flight path. The lander fired its small thrusters for 12.6 seconds to adjust its speed by about 0.6 meters per second (about 1 mile per hour). The lander is currently traveling at a speed of 19,300 kilometers per hour (12,000 miles per hour).

"The current estimates show that we are right on target," said Dr. Sam Thurman, flight operations manager for the lander at JPL. "The navigation team says we are very close to the target point for atmospheric entry on Friday. A large team has been working since Thanksgiving, doing everything that's necessary to get us on the proper flight path for a good entry position."

When the spacecraft arrives at Mars, it must enter the atmosphere through a corridor that is 10 kilometers (6 miles) wide and 40 kilometers (25 miles) long and begins about 125 kilometers (78 miles) above the surface.

Early Friday morning, the team will evaluate whether they need to perform an additional maneuver to fine-tune the landing. If needed, this final maneuver would take place on December 3, at 5:30 a.m. Pacific time, about six hours prior to entry into the Martian atmosphere.

Later today, the flight team will start the master sequence on the spacecraft that begins the countdown for the entry, decent, and landing activities. The lander is currently 3.5 million kilometers (about 2 million miles) from Mars, and is scheduled to land on

Friday, December 3, shortly after noon Pacific time.

Mars Polar Lander is part of a series of missions in a long term program of Mars exploration managed by JPL for NASA's Office of Space Science, Washington, D.C. JPL's industrial partner is Lockheed Martin Astronautics, Denver, Colo. JPL is a division of the California Institute of Technology, Pasadena, Calif.

Note from the Desk of the Editor

The newsletter is a good means of communication for the club. If there is anyone who wants to contribute an article on any astronomical subject, please feel free to do so. I will include it in the next edition of The Observer. Any comments or suggestions are also welcome. You can send them via e-mail to bruisse@ameritech.net, or you can mail them to me at home:

Jeff Lewis
5623 Allendale Drive
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