



The Refractor

The Bulletin of the Eastbay Astronomical Society

Founded in 1924 at Chabot Observatory, Oakland, California

Volume 72
Number 4
December 1995

Members Night and Holiday Potluck at the EAS

Saturday, 9 December, 6:30 p.m.

Physics Classroom, Chabot Observatory
Presentations: Space Science Classroom
4917 Mountain Boulevard, Oakland

You are invited to bring your astronomical and gastronomical offerings to share with the group on Saturday, 9 December. Celebrate the holidays by stuffing ourselves with goodies. Then we'll convene to see your goofs, gaffs, and gifts and to listen to your funny stories. But please limit your presentations to 15 minutes or less; call Dave Rodrigues at (510) 483-9191 with a description of your contribution to the program. Please call Dave also with what you are thinking of bringing for dinner so he can guard against ending up with 15 potato [potatoe] salads!

In addition to the slides and astrophotos you, the members, will show, we'll hear a repeat talk of the one given by Mike Reynolds and Carter Roberts at the fourth annual convention of the Antique Telescope Society in Philadelphia. They'll tell us about seeing the nineteenth-century six-inch telescope that was the inspiration for the beginnings of Chabot Observatory. Carl Trost will give a report of his trip to Allahabad, India, for the total eclipse of the Sun in October.

The December meeting is also the annual election for Eastbay Astronomical Society officers and board members. Bylaws dictate that nominations be closed with the previous meeting, so it is likely that the current officers will return for another year's duty.

Planned for the EAS meeting on 13 January will be a program devoted to computers in astronomy. Details will be announced in the next issue of *The Refractor*. For our program at the February meeting, Dr. Richard Young, guest speaker at our April banquet, will return to give us a follow-up on the Galileo Project. It is expected that we will be among the first to learn some of the implications deduced from the December 7 plunge of the Galileo Probe into the atmosphere of Jupiter.



Prior to moving to California, James C. Gilson visited Philadelphia and was very impressed by the 6-inch Merz und Mahler equatorial telescope in the Philadelphia High School. On becoming Superintendent of the Oakland School District in 1882 he informed the Board of Education that he wanted to find a donor who would endow an astronomical observatory for the children of Oakland.

Such an observatory, the gift of Anthony Chabot, was authorized by the Oakland City Council on April 16, 1883, to be constructed on Lafayette Square in downtown Oakland. The Chabot Observatory was relocated to its present site in 1916 at the time of acquisition of the 20-inch telescope, Rachel, so named by Observatory Director Charles Burckhalter after the Biblical story of Jacob.

The Tachi Yokuts

of Central California tell of Wolf, a good but self-centered hunter, who seldom brought enough back home to Crane, his wife, and their two boys. Barely subsisting on roots and acorns, the family grew increasingly desperate and at last Crane took her sons off with her to search for a better life. When Wolf returned from his hunt and found them missing, he became enraged. He decided to track them down and kill them. [Violence in the media has been around for a long time.] Remember that Wolf was good at hunting and tracking, and he was soon on the trail. He caught up quickly but Crane was flying too high for Wolf's arrows to reach. He followed the group until they had to come down to rest, and then he shot



Orion, with its many bright stars, dominates the evening skies in winter, easily conjuring up ideas of a giant; and so it has done for ages. Sun-god of the Phoenicians, Sumerians and Egyptians, this giant was Phaethon to the Greeks. The classic Roman legend is of the hunter, killed by his lover Diana's arrow when she was tricked by her twin Apollo.

Crane. He edged up to where she lay and poked at her with his paw to see if she were still alive. Crane had enough strength left to surprise Wolf and stab him with her sharp bill. Repeatedly she jabbed him until he was dead. Without looking back, and without remorse, she led her boys and flew high into the sky—ever higher until they became stars. We can see them as the three stars of Orion's belt, and we remember that it is not good to be selfish.

Among the Wasco tribe east of the Chinook country of the northwest there was an old grandfather who caught many salmon in the Big River. Grandson Chinook Wind lived happily with the old man and they always had plenty to eat. One day Chinook Wind went to visit his relatives along the coast, and it was then that Cold Wind began to steal salmon from Old Grandfather. Cold Wind was lazy and never came down to the river until it was too late to catch anything. All he could do was watch Old Grandfather carrying many fish back to camp. Each day Cold Wind would steal a salmon, even though Old Grandfather would surely have given him a generous share if only the boy had been more courteous or more industrious. When Chinook Wind returned and discovered what was happening, he grew angry and determined to teach Cold Wind a lesson, as well as to protect his grandfather and the tribe. Cold Wind countered Chinook Wind's challenge and the two agreed to settle the affair in a wrestling match. They fought hard, and at length Chinook Wind subdued the young trouble-maker. Always since then,

Chinook Wind has been stronger than Cold Wind, and Cold Wind cannot take salmon away from Old Grandfather. If you look in the sky, you can see Chinook Wind and his brothers in his canoe (Orion's sword) far ahead of Cold Wind's canoe (Orion's belt).

It is interesting to note that the three stars of Orion's belt were also thought of as a canoe by the ancients of New Zealand, who linked them to the god Maui. This remarkable trio of stars, lying in a straight line and of equal brightness, are quite naturally regarded as belonging together in many cultures. In Mongolia, the stars are the Three Dogs, while in Norse legend, they are said to be the Spinning Wheel of the Queen of Heaven, Frigga, wife of Odin.

Mintaka, westernmost of the three belt stars, has the distinction of lying almost exactly on the celestial equator, with a declination of +18 minutes. It is a triple star, the primary of magnitude 2.2 and companions at 53" and 33" separations of magnitudes 6 and 14. Of a number of other double stars in the constellation, Orion's brightest, Rigel, is a fine example. The components are of magnitudes 0.1 and 6.8, 9.5" apart.

The stars of the Orion constellation are among the best known in all the sky and include the first magnitude stars Rigel and Betelgeuse as well as several between first and second magnitude. Orion contains several other wonders as well, principally the Great Nebula, M42, one of the few nebulae that you can see with the unaided eye, and possibly the nearest place to us where extensive star birth is taking place.

M78 is a reflection nebula that might be a more sought-after target if it were not situated among more well-known neighbors. The Horsehead Nebula is another Orion feature, found near the belt of Orion midway between M78 and M42/M43. However, this dark nebula silhouetted against a glowing cloud of cosmic dust cannot be seen with the unaided eye, and it requires long photographic exposures to reveal its remarkable detail.



Conrad Jung used his 10-inch 1/4 reflector with hypersensitized Konica 400 film in this 30-minute exposure of M42 and M43 in Orion as seen from Fremont Peak.

The Skywatcher's Diary

[Because of the Thanksgiving holidays and an early publishing deadline for *The Refractor*, the regular *Skywatcher's Diary* from Abrams Planetarium is not available. The following substitution is the responsibility of the editor, so watch out for inaccuracies and false leads.]

During the first part of December, all the planets except Pluto will be in the evening sky. Finding them all on a single night will be difficult, however, because Jupiter is moving into the Sun's realm of light as Mercury is emerging into our view. Look immediately after sunset for a chance to see these two planets, along with ruddy Mars. Venus is gaining splendor as the month progresses. Saturn remains an interesting object in Aquarius, particularly in the telescope, for the rings are now back-lit by the Sun and they appear dark. They are also seen nearly edge-on to us, a situation that repeats only every fifteen years, half the period of Saturn's orbit around the Sun.

Friday, December 1

Venus, Mars and Jupiter are low in the SW at dusk. Look to the right of the Teapot of Sagittarius. Saturn is high in the SSE.

Saturday, December 2

The Sky Tonight is the classic, live planetarium show at Chabot, highlighting the skies of Oakland. Tonight at 7:30.

Sunday, December 3

Venus is climbing in altitude throughout the month, while Jupiter drops into the glare of the setting Sun.

Monday, December 4

Tonight and tomorrow night the Moon will be near the Pleiades.

Tuesday, December 5

Watch the Moon as it heads in the direction of the Hyades cluster. By tomorrow night it will have passed the bright star Aldebaran.

Wednesday, December 6

Before sunrise you can see that the Moon is still among the Hyades and has not yet caught up with the Bull's eye, Aldebaran.

Thursday, December 7

The Moon is full tonight at 6:27 PST.

Friday, December 8

This is the earliest sunset of the year, although not the shortest day.

Saturday, December 9

This would be a good day for a potluck dinner, and perhaps a look through a 20-inch telescope later in the evening.

Sunday, December 10

At dawn, the Moon lies midway between bright stars Pollux and Procyon, two of the stars of the winter hexagon asterism.

Monday, December 11

At dusk, Mars is still visible low in the SW, with Venus above and to the left of it.

Tuesday, December 12

In the early morning sky, the waning gibbous Moon is wending past Regulus in Leo.

Wednesday, December 13

The Geminid meteors will be on display, active in the evening, best before moonrise. But look also tomorrow night when the Geminids should be nearly as active and there's another hour of darkness before the Moon comes up.

Thursday, December 14

Moon is at last quarter at 9:33 p.m.

Friday, December 15

Titan, Saturn's largest moon, is at maximum elongation from the planet.

Saturday, December 16

Venus is now at its closest to Neptune, but neither Neptune nor nearby Uranus will be easily found in small telescopes.

Sunday, December 17

At 3 a.m. the Moon is 2 degrees NNE of Spica.

Monday, December 18

Jupiter is at conjunction with the Sun. It will reappear in the dawn sky in early January.

Tuesday, December 19

Narrow crescent Moon in the morning sky is steering to the north of Antares.

Wednesday, December 20

In the morning, you can still see the thin old Moon near Antares. In the evening, Venus is 4 hours east of the Sun, shining with a magnitude of -4. Uranus is 1.2 degrees NNW of Venus at a magnitude of 5.9.

Thursday, December 21

Mars and Mercury are low in the SW at sunset, close together below and to the right of Venus.

Friday, December 22

Winter solstice is at twenty minutes past midnight this morning. Moon is new at 6:22 p.m. PST. Moon is also at perigee, so watch for very high tides.

Saturday, December 23

Before dawn, the Ursid meteors should be at their best. Look at sundown for the very new Moon at the same altitude as the very bright Venus. Mercury and Mars are on the horizon, just a degree apart. Mercury is brighter at magnitude -0.7, with Mars at 1.2.

Sunday, December 24

Moon is directly above Venus in the evening sky for a striking view. If it is foggy, watch for a twinkling red reindeer nose.

Monday, December 25

Venus dominates the southwestern sky, while Saturn still commands notice farther to the south.

Tuesday, December 26

Tonight and tomorrow night, the Moon and Saturn are together in the South.

Wednesday, December 27

The Moon has passed Saturn and now lies above the planet. Mercury may be visible to the lower right of Venus in the sunset sky.

Thursday, December 28

Moon at first quarter, 11:06 a.m. PST.

Friday, December 29

Comet Honda-Mrkos-Pajdusakova is at predicted peak magnitude, one of the brightest comets of recent years. Check the coordinates in Don Machholz's column on page 5. The comet will be quite near Venus. Be careful not to let the planet's brilliance interfere with your dark adaptation.

Saturday, December 30

The Chabot Planetarium presents *The Universe of Dr. Einstein*.

Sunday, December 31

Mercury is within a degree of Uranus, but very low in the WSW. Set your clocks back a second—a leap second will be added to the end of the year to adjust calendar time to international atomic time.

The Space Shuttle Columbia

streaked over the Bay Area at 3:23 a.m. on Sunday, 5 November, to the delight and wonder of observers including several members of EAS. These amateur astronomers had all been alerted to the possible rare visibility of the reentry by Pleasant Hill satellite orbit expert, Don Charles. Dave Rodrigues, arriving at his home on Saturday night at 10:30, checked his answering machine to find Don's forecast. He immediately called Chabot Observatory where he alerted Carter Roberts, Conrad Jung, Don Stone and Alan Roche. After much frantic consultation about the weather, and after many phone calls back and forth, they decided to head east to escape the fog in the East Bay. They arrived in Pleasanton just in time to see a yellow fireball appear to be heading straight for them out of the west. Passing to the north of them, apparently through the North Star, the 2800° Fahrenheit fireball changed color to a pinkish-purple and disappeared to the east in about four minutes. Traveling at approximately 10,000 miles per hour at an altitude of about 60 miles, the spacecraft left an unusually distinct, high-altitude contrail running east-west to the north of the group's location.

"It was almost as exciting as a solar eclipse!" yelled Carter, in obvious wonderment. "One of the most stunning sights of my life," said EAS Program Director Dave Rodrigues. "Wow!" was all that Chabot Observatory astrophotographer and instrument director Conrad Jung could utter.

As Columbia continued beyond sight toward its landing at Kennedy Space Center in Florida, the exhilarated observers celebrated by having an early breakfast (or very late dinner) at a Castro Valley restaurant.

STS-73 Columbia was launched on October 20 to begin the 16-day US Microgravity Spacelab 2 Mission. Its re-entry path bringing it within visibility from our latitude was rather unique.



Stellar "EGGs" Emerge

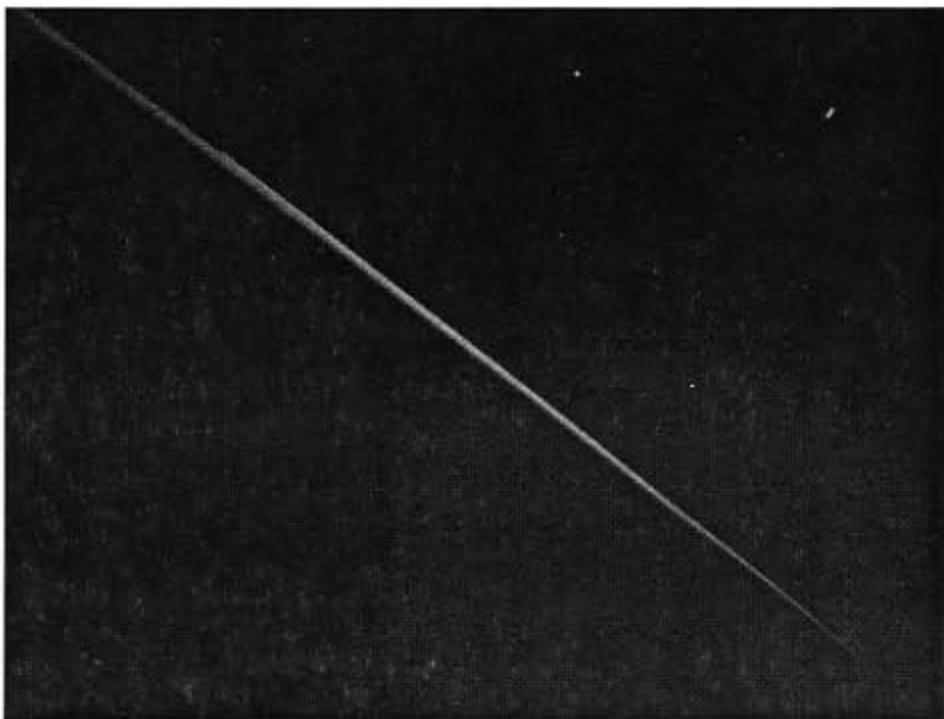
from a molecular cloud in M16. This eerie, dark structure, resembling an imaginary sea serpent's head, is a column of cool molecular hydrogen gas (two atoms of hydrogen in each molecule) and dust that is an incubator for new stars. The stars are embedded inside finger-like protrusions extending from the top of the nebula. Each "fingertip" is somewhat larger than our own solar system. The pillar is slowly eroding away by the ultraviolet light from nearby hot stars, a process called "photoevaporation". As it does, small globules of especially dense gas buried within the cloud are uncovered. These globules have been dubbed "EGGs"—an acronym for "Evaporating Gaseous Globules". The shadows of the EGGs protect gas behind them, resulting in the finger-like structures at the top of the cloud.

Forming inside at least some of the EGGs are embryonic stars—stars that abruptly stop growing when the EGGs are uncovered and they are separated from the larger reservoir of gas from which they were drawing mass. Eventually, the stars emerge as the EGGs themselves succumb to photoevaporation.

The stellar EGGs are found, appropriately enough, in the "Eagle Nebula" (also called M16—the 16th object in Charles Messier's 18th century catalog of "fuzzy" permanent objects in the sky), a nearby star-forming region 7,000 light-years away in the constellation Serpens.

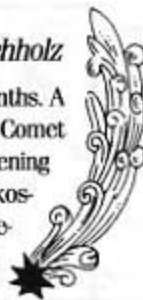
The picture was taken on April 1, 1995 with the Hubble Space Telescope Wide Field and Planetary Camera 2.

Credit: Jeff Hester and Paul Scowen (Arizona State University), and NASA.



Comet Comments *By Don Machholz*

Comet activity has picked up in the past few months. A couple of new comets have outburst. One, Periodic Comet Schwassmann-Wachmann 3, remains in our southern evening sky. Not far away is Periodic Comet Honda-Mrkos-Pajdusakova. Meanwhile, Comet Hale-Bopp slips behind the Sun: in three months it will reappear in the morning sky. Reports of the comet dimming are not true; the comet was simply seen against a thicker Milky Way background.



Date (00UT)	R.A. (2000)	Dec.	Elong.	Sky	Mag.
Comet 122P/de Vico [Hercules]					
11-29	16h42.3m	+23°02'	45°	E	9.6
12-04	16h56.0m	+21°50'	44°	E	10.0
12-09	17h08.2m	+20°47'	44°	E	10.3
12-14	17h19.1m	+19°53'	43°	M	10.6
12-19	17h28.9m	+19°08'	43°	M	10.9
12-24	17h37.9m	+18°30'	43°	M	11.2
12-29	17h46.1m	+17°59'	43°	M	10.3
1-03	17h53.7m	+17°35'	43°	M	11.7
1-08	18h00.6m	+17°17'	44°	M	12.0
Comet 1995 Q1 (Bradfield) [Camelopardalis-Cassiopeia]					
11-29	09h11.6m	+75°31'	115°	M	11.1
12-04	07h34.9m	+79°06'	120°	M	11.4
12-09	05h23.0m	+79°29'	123°	M	11.6
12-14	03h44.4m	+76°52'	125°	E	11.9
12-19	02h51.6m	+73°03'	129°	E	12.2
12-24	02h23.8m	+69°06'	124°	E	12.4
12-29	02h08.5m	+65°23'	121°	E	12.7
1-03	02h00.0m	+62°03'	118°	E	13.0
1-08	01h55.4m	+59°05'	114°	E	13.3
Comet 73P/Schwassmann-Wachmann [Capricornus-Aquarius]					
11-29	20h34.4m	-28°42'	58°	E	8.0
12-04	20h56.1m	-27°18'	58°	E	8.2
12-09	21h16.3m	-25°48'	57°	E	8.5
12-14	21h35.1m	-24°13'	57°	E	8.7
12-19	21h52.6m	-22°35'	56°	E	8.9
12-24	22h09.0m	-20°57'	55°	E	9.1
12-29	22h24.4m	-19°19'	54°	E	9.3
1-03	22h38.8m	-17°42'	53°	E	9.0
1-08	22h52.5m	-16°06'	51°	E	9.8
1-13	23h05.5m	-14°32'	50°	E	10.0
Comet 45P/Honda-Mrkos-Pajdusakova [Sagittarius-Capricornus]					
11-29	19h14.9m	-25°03'	41°	E	11.5
12-04	19h30.2m	-24°35'	39°	E	10.6
12-09	19h45.6m	-23°59'	38°	E	9.6
12-14	20h00.5m	-23°15'	36°	E	8.7
12-19	20h13.9m	-22°24'	34°	E	7.9
12-24	20h24.2m	-21°30'	32°	E	7.4
12-29	20h29.5m	-20°35'	28°	E	6.9
1-03	20h28.1m	-19°43'	23°	E	7.0
1-08	20h18.4m	-18°49'	16°	E	7.1
1-13	19h59.4m	-17°44'	07°	M	7.4

Reaching its ultimate destination after an already eventful space journey of more than six years and 2.3 billion miles,

NASA's Galileo mission

will arrive at the giant planet Jupiter on December 7, 1995. By day's end, Galileo should be the first spacecraft to enter orbit around one of the solar system's giant outer planets, and the first to send an instrumented probe directly into one of their atmospheres. The Galileo orbiter spacecraft then will begin at least two years of close-up observations of Jupiter, its moons, its faint rings and its environment.

The chain of key mission events for Galileo on Jupiter arrival day begins with a close flyby of the moon Io by the Galileo orbiter at a distance of just 600 miles (1,000 kilometers). The probe has been traveling a separate path toward atmospheric entry since it was released by the Galileo spacecraft on July 13.

Four hours later, the orbiter will link up by radio with the Galileo probe as it floats via parachute through the top level of Jupiter's atmosphere. By then, the conical probe will have slammed into the upper fringe of Jupiter's atmosphere at a top speed of 106,000 mph and endured deceleration forces as high as 230 times Earth's gravity. Dropping downward on its eight-foot diameter parachute, the probe will make the first direct measurements of Jupiter's atmosphere and clouds, and it may encounter lightning or even water rain as it descends more than 125 miles (200 kilometers) from the top of Jupiter's clouds.

The Galileo orbiter will record the measurements radioed from the probe for up to 75 minutes, before finally turning away to prepare for a crucial 49-minute-long burn of its main rocket engine that will insert the spacecraft into Jovian orbit.

The orbiter will then begin its tour of at least 11 orbits of the Jovian system, including four close encounters with Ganymede and three each with Callisto and Europa, and observing Io's erupting volcanoes. In mid-March, Galileo will fire its main rocket engine for one last major burn to put itself into an orbit away from the most intense Jovian radiation environment.

Galileo was launched aboard Space Shuttle Atlantis and an IUS on October 18, 1989. In addition to its Earth and Venus flybys, Galileo became the first spacecraft ever to fly closely by two asteroids, Gaspra and Ida. During the second asteroid encounter, two of Galileo's 10 science instruments discovered a small moon — later named Dactyl — orbiting around Ida, the first time such an object has been confirmed. Galileo's instruments also performed the only direct observations of the impact of the fragments of Comet Shoemaker-Levy 9 with Jupiter in July 1994, providing key insights into the early stages of the impact evolution. We can only imagine the discoveries that will flow from Galileo as it travels for months in this most unusual and unearthly environment.

Articles and photos for *The Refractor* are encouraged. Deadline for the January issue is December 13, 1995. Items may be submitted by mail to the editor, Ellis Myers, 215 Calle La Mesa, Moraga, CA 94556. Files on disk should be ASCII PC format, 3.5-inch 1.4M. Internet e-mail address is emyers@crl.com. For further information please call (510) 284-4103.

DATELINE DECEMBER

- 14 1546 Tycho Brahe, born
27 1571 Johannes Kepler, born
25 1642 Isaac Newton born, Lincolnshire, England
16 1857 Edward E. Barnard, born
11 1863 Annie J. Cannon, born, pioneer spectroscopist
24 1968 Apollo 8, first manned spacecraft to orbit the Moon
15 1970 Soviet Venera 7 touches down on Venus, first soft landing on another planet
2 1993 Endeavour STS-61, Hubble service mission, launched
- 6 1995 Full Moon, 17:27 PST - 01:27 UT 7 December
14 1995 Geminid meteors peak, 02 PST
14 1995 Last Quarter Moon, 21:33 PST - 05:33 UT 15 Dec.
21 1995 New Moon, 18:22 PDT - 02:22 UT 22 December
28 1995 First Quarter Moon, 11:06 PDT - 19:06 UT

UPCOMING EVENTS

- 7 December.** Galileo probe enters Jupiter's atmosphere, 14:04 PST.
9 December. EAS members meeting and potluck dinner, 6:30 p.m. Election of officers.
14 December. EAS Board meeting, 7:30 p.m.
13 January. EAS lecture meeting, TBA.
23 March. AANC Workshop. Deep-sky observing.

EAS Officers

- President: Carter Roberts (510) 524-2146
Vice President: Phil Crabbe II (510) 655-4772
Secretary: Kevin Cox (510) 528-2181
Treasurer, Membership: Don Stone (510) 733-6738



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