

# The Refractor

*The Bulletin of the Eastbay Astronomical Society*  
 Founded in 1924 at Chabot Observatory, Oakland, California

Volume 82  
 Number 4  
 February 2006

February 2006 talk:

## *Project: Deep Impact*

Saturday, February 11, 2006, 7:30 pm

Speaker: Dr. Diane Wooden, of NASA/Ames

Chabot Space & Science Center

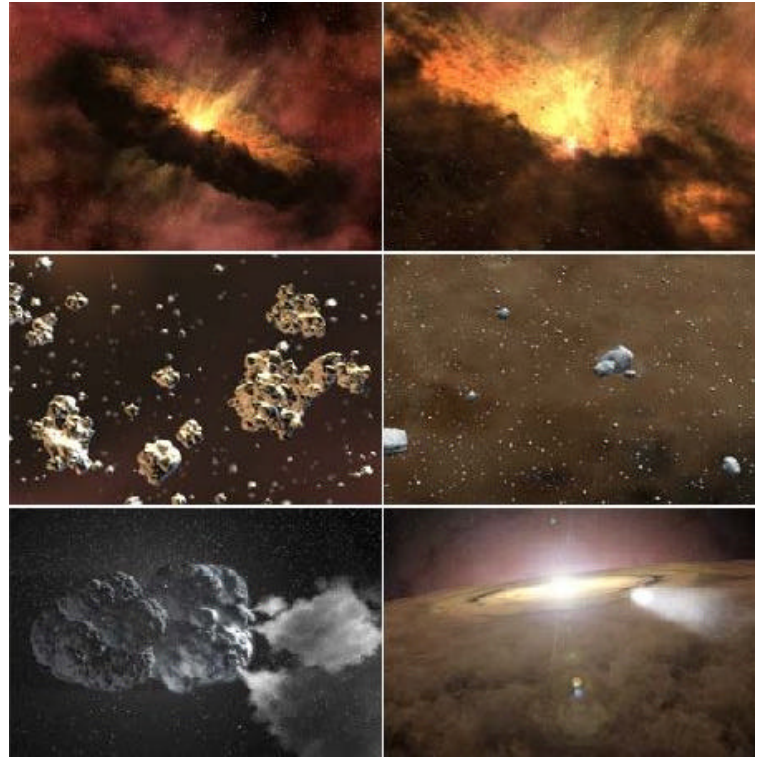
Physics Lab, 2nd Floor, Spees Building

**O**n July 4, 2005, after a voyage of 173 days, and a distance traveled of 268 million miles, a remotely-controlled speck of metal about the size of a Cooper Mini, successfully launched an 820 pound copper impactor. Its target: a significantly larger speck known as Comet Tempel 1 (a dirty spacebound snowball, roughly 9 x 3 x 3 miles). The energy of the impact was expected to come to 19 gigajoules (about 4.5 tons of TNT). The size of the crater was estimated to be anywhere from the size of a large house, to the size of the Coliseum. Despite this seemingly gargantuan amount of explosive power, the comet's trajectory would not be affected; no more than, say, a mosquito running into a 727 jetliner. Why was this done? Why was this particular comet chosen as a target? What have we learned from this encounter? These and many other questions will be answered by this month's special guest speaker, Dr. Diane Wooden.



Dr. Wooden received her Ph.D. in astronomy and astrophysics from UC Santa Cruz in 1979, and has been an astrophysicist at the NASA Ames Research Center since 1983. She studies the origins and evolution of cosmic dust, and observed Deep Impact from the NASA Infrared Telescope Facility on Mauna Kea in Hawaii. "Comets are the deep-freezers of what was happening in our solar nebula at the time that Jupiter and Saturn were forming. They were kicked

out of the part of the planetary system where giant planets were forming, so that they became sort of in stasis. When they come now close to the Sun, they release their material from billions of years ago, and sort of tell us the story of what was happening then. I'm very interested in the dust because the dust is the building blocks of the planets," ★



*Genesis of a Comet: From a cloud of gas and dust surrounding a proto-star, molecules clump together to form chunks of ice and rock, which in turn clump further to form a larger "dirty snowball." If it get pushed or pulled into an orbit that brings it close to the star, the ice sublimates from solid to gas, and the solar wind pushes the gas and released dust grains away in a visible stream that can sometimes grow to tens of millions of miles—the comet's "tail." If the Earth in its orbit, happens to pass through the dusty trail left behind by the comet, we get a meteor shower. If the dust trail happens to be particularly thick or dense, we get the much rarer meteor storm, as happened in 1833, 1966, 1999, and 2002, where hourly rates of thousands to tens of thousands of meteors were observed!*

### DINNER WITH THE SPEAKER

5:30 pm

Saturday, February 11

**HUNAN YUAN**

4100 Redwood Rd., #11

(next to Safeway)

Oakland

(510) 531-1415

No need to confirm—just show up!

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# The Crescent Moon in Christian and Islamic Religions

By Jim Scala

People have probably always enjoyed the beauty of a waxing or waning crescent moon. In ancient times it was also somewhat mysterious because how could something so beautiful disappear and then reappear three days later in another form. Are you surprised that the moon has had a significant place in Islam and Christian religions? Indeed, as current worldwide strife appears to involve both religions, it's worthwhile to consider their non-religious common denominators. Who knows, it might help improve relationships.



Waning crescent Moon - October 2005

Magi were Zoroastrian priests who believed that the stars influenced human events. They accurately plotted the paths of the moon, planets and comets among the stars and they were excellent astronomers. Zoroastrianism, founded by Zoroaster (628-551 BCE), was the dualistic religion of Persia based on a divine vision. Two thousand ten years ago, an occultation of Jupiter by the waxing crescent moon would have been the most important astronomical event to the Magi. A similar occultation today would find many of us traveling long distances to observe it. Imagine if you believed the event predicted when and where the birth of a divine being would occur.

The New Testament teaches that the Magi made a pilgrimage to witness the event and brought gifts to anoint the divine child whose birth it predicted. The Book of Mathew teaches that they carried gifts of gold signifying his kingship over all kings, Frankincense, signifying his divine birth, and Myrrh, signifying that he would defeat death. Much has been written about the Christmas star that predicted and coincided with the birth of Jesus. Most authors have ascribed it to a bright and widely visible star. Indeed theories abound ascribing the star to the planet Venus, planetary conjunctions, a supernova, a comet and other events. Obviously I disagree with them.

A bright, widely visible object would have been widely reported. For example, Venus, a Comet or Supernova couldn't have gone unnoticed since any one would have been visible from an entire continent, if not the world; possibly even during daylight hours. In contrast, the waning crescent moon

## What's the crescent moon got to do with Christianity's beginning?

About 2008 years ago the Magi predicted that two occultations of Jupiter by the waning crescent moon would occur; one would be visible from what is now Israel against a

dark morning sky. Magi were Zoroastrian priests who believed that the stars influenced human events. They accurately plotted the paths of the moon, planets and comets among the stars and they were excellent astronomers. Zoroastrianism, founded by Zoroaster (628-551 BCE), was the dualistic religion of Persia based on a divine vision. Two thousand ten years ago, an occultation of Jupiter by the waxing crescent moon would have been the most important astronomical event to the Magi. A similar occultation today would find many of us traveling long distances to observe it. Imagine if you believed the event predicted when and where the birth of a divine being would occur.

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is visible for a very short time just before dawn in a confined area and the occultation, a rare event would have been barely visible from a relatively small area. However, the Magi knew when it would occur, where it would be visible and their religion taught that the child born under it would have divine influence over mankind. Laypersons in Israel would have been unaware of this event because the Magi came from what is now Iran. Therefore, the occultation of Jupiter by the waning crescent moon in 3 BCE fits the New Testament *Christmas Star* story like a glove. More, it tells us why no written records or drawings of an unusually bright star or other object at the time have ever been found. In contrast, records of the supernova that created the Crab nebula have been found in many places worldwide; similar with Halley's comet.

In 3 BCE there were actually two waning crescent moon occultations of Jupiter; one was when the moon was rather high in the sky and wouldn't have been visible without a telescope. So, I conclude that the visible occultation was probably the one the Magi followed and their pilgrimage was necessary for them to observe it. Since the first book of the New Testament wasn't written for least 80 years after the death of Jesus, the writer's information would have been generally second hand since at the time life expectancy was under 40 years and no one would have been alive who had witnessed the event. For example, we still debate significant events that occurred in 1925 when reporters were present and pictures

were taken; just imaging if the printed word was scarce.

In 622, the prophet Muhammad (570-632) founded his religion based on the religion of Abraham and he embraced much of Christianity and Judaism. He based his religious year on the lunar calendar and chose the day following the first crescent moon sighting as the starting date of each month. You might ask, why not base the start date on a full moon or a new moon because they could be easily and very accurately identified in 622? I believe it has to do with



Why does the Islamic Temple have minarets? This Two Minaret Mosque Dominates the South Entrance of the Suez Canal.

the *beginning* rather than the middle; however, if you can help here, I'd like to know. By selecting the first observable crescent, Muhammad chose a time frame that averages out quite well even though it appears somewhat inaccurate to us with our sophisticated instruments. Let's consider some examples.

*Continued Page 3*

**What if we used the crescent moon for our calendar and we had no telescopes?** This very brief exercise supposes we decided to use the waxing crescent moon to start each month by watching for it and by knowing the New Moon had just occurred. Better, we could assign keen-eyed people who knew where to look to watch for the first crescent. It's rather widely accepted that at sunset a keen-eyed person can spot a 24-hour crescent and sightings of the 20-hour moon are frequently recorded. Seldom discussed is that by watching for the last waning crescent a person could predict the New Moon very accurately and know when to spot the first waxing crescent. Let's see how we'd do for the first three months of 2005 in California.

**January, 2005:** NM was January 10 at 1203 PST; our first sighting could be on January 11 at 1719 PST when the moon would be 31 hours 4 minutes old. The month would begin on January 12<sup>th</sup>. This is the last month of the Islamic year 1425.

**February, 2005:** New Moon is February 8, at 1528 PST; our first sighting could be on February 9 at about 1744 PST when the moon is 26 hours 16 minutes old. An especially keen-eyed watcher might see it at 24 hours 16 minutes. The month would begin on February 10<sup>th</sup>. This actually marked the first lunar month of 2005, so in the Islamic calendar, February 10, 2005 is New Year's Day.

**March, 2005:** New Moon is March 10, at 0210PST; our first sighting could occur on March 11 at 1806 PST when the moon is 39 hours 56 minutes old. Even a keen-eyed watcher couldn't do better than about 35 hours. So, the second month of 2005 would begin on March 12<sup>th</sup>.

This short exercise illustrates that although a *crescent moon sighting* based calendar appears imprecise, it averages out quite nicely. Since the lunar calendar is just over 354 days, it requires a correction every so often by simply adding a day for a 355 day lunar leap year. Not bad considering we need a leap year in our own calendar with all our sophisticated instruments.



Islam relies on waxing crescent Moon for its entire calendar. This Mosque dominates the skyline of Istanbul, Turkey

Followers of Islam pray five times daily facing Mecca to achieve oneness with God in concert with the five pillars of their faith. Prayer times vary from place to place and while nowadays they are listed on

television and in the daily newspapers, in early times people were called to prayer by religious leaders who climbed the minaret from where they could be heard. Therefore, most Islamic temples have four minarets covering all four points of the compass. In older times these minarets often dominated the skyline. With high-rise buildings of today, they don't always dominate, but they do characterize the skyline. This illustrates nicely that there are many temples and they have a

consistent design. Nowadays the minarets have loud speakers and the call to prayer is issued by someone inside the temple.

**How do you set five daily prayer times so they are universal throughout Islam?** Imagine 1,000 years ago trying to accurately set five daily prayer times so that they will be the same everywhere. You'd have to use the sun; that's exactly what was chosen. The first time is at the start of astronomical twilight; then transit time; halfway to sunset; sunset, and the last at the end of astronomical twilight. Although we think of morning and evening twilight as somewhat arbitrary, if a person dedicates himself it can be determined quite accurately. Similar to sighting the crescent moon, it averages out quite nicely. The prayer times are as follows:

1. Fajer: Starts at astronomical morning twilight.
2. Dhohor: Transit time determined with great accuracy simply using a shadow.
3. Asr: Halfway, determined when the shadow of a stick equals it's length plus the length of it's shadow at Dhohor. Again, a very accurate determination.
4. Maghreb: Sunset which only requires a clear horizon.
5. Isha: the end of evening twilight.

A somewhat more recent innovation is that twilight and sunset determinations are made from 1,000 feet above sea level. Muhammad chose a calendar and prayer times that, although they are determined locally, are the same throughout the Islamic world in a time when accurate clocks didn't exist. Obviously, this serious religious function became easier as astronomy developed more tools, clocks became more accurate and calculations became easier. Indeed, many scholars have concluded that the need to accurately determine celestial timings helped nurture astronomy.

**Does the crescent moon appear elsewhere in religious practice?** Although this article contains plenty of discussion material, the crescent moon is involved both factually and symbolically elsewhere in religion. The waxing and waning crescents have places in Stonehenge and other similar observatories in both the old and new worlds, albeit they're seldom discussed. That's because emphasis is placed on sun lines these ancient observatories used to accurately identify the equinoxes which were essential for agriculture. The waning crescent, new and waxing crescent moons have another place in early Christianity's rich symbolism which involves Christ's death and resurrection. These are discussions for another time.

**Acknowledgement:** *I am grateful to Mr. Mohammed Odeh of the Jordanian Astronomical society for identifying the determination of prayer times.*

**About the Author:** *Jim Scala has been featured in Star People and enjoys contributing articles to Amateur Astronomy and the correspondence with other amateurs they generate. He lives in the San Francisco Bay Area where his backyard observatory houses a 228-mm APO refractor. He enjoys visitors to his observatory, please contact him at [jscala2@comcast.net](mailto:jscala2@comcast.net). ★*



## Editor's News 'n Views

**Howdy, Astro Fans!** It's still Winter here in the Land of Oaks, but things sure got hot at our January meeting, with burning metals, redly glowing steel wool, and oxidizing chemicals (i.e., fireworks!); all in the name of education, you understand. We had

more fun than a barrel of glowing electrocuted pickles (which still tasted good, afterward—don't ask how I know). **Roland McLemore** and **Dr. Jacques Guertin** showed us how they use some amazing, and pretty darn spectacular, demonstrations to arouse their students' curiosity about the physics of our universe. It was a fun one!

**Did you see it?** We did, but we all missed getting any images of it. A bunch of us (**Conrad Jung, Alan Roche, Dave Rodrigues, Jim Kosinski, and Ryan Turner**) went to the hills of Livermore during the wee hours of Sunday, January 15th, to see if we could catch a glimpse of the Stardust space capsule's fiery return to Earth. Ironically, with all those amateur astronomers out there, looking at the anticipated time and place, it was a mother and her two daughters who spotted it first! It wasn't super-spectacular or anything, but it was pretty cool. I'd describe it as a reddish-amber colored dot, skimming high above the northern horizon, over the semi-distant town of Livermore, moving from west to east, looking like a very fast moving satellite. I'd guess it traveled about 30° in about 10-15 seconds. We all expected it to start more to the west than what it actually did, which is why we missed photographing it. The series of photos (opposite) were taken from a very nifty video captured from NASA's DC-8 aircraft. You can see this video at the following web page:

[http://stardust.jpl.nasa.gov/anim/stardust\\_reentrya.mov](http://stardust.jpl.nasa.gov/anim/stardust_reentrya.mov)

We've got a few events on the horizon at this time, and you'll want to mark your calendar, forthwith. Saturday and Sunday, March 25 & 26 is the best weekend to try for a successful Messier Marathon, but Tuesday and Wednesday, March 28 and 29 will



have virtually no moon at all. Here's a good book about the best way to do it, available from Amazon.com for about \$13—\$20: *The Observing Guide to the Messier Marathon: A Handbook and Atlas*, written by Don Machholz. There is also a great website with general information about the Messier Marathon at <http://www.seds.org/messier/Xtra/marathon/marathon.html>.

Of course, our club's Annual Awards Dinner is coming up next month on the evening of Sunday, March 12 (how could you miss the yellow flyer?) We've got an incredible speaker this year: Professor and Nobel Laureate **Charles H. Townes**, a man whose name has already entered the halls of historic scientific discovery for his groundbreaking work in the field of masers and lasers. This is one event you're not going to want to miss! **TICKETS MUST BE PURCHASED BEFORE FEBRUARY 27** so we can tell the caterer how much food to make; we need at least 50 people, so don't delay!

We had an election last month for our club officers. Here are the results: President, **Carter Roberts**; Vice-President, **Paul Hoy**; Secretary, **Linda Lazzaretti**; Treasurer, **Don Stone**; Membership Registrar, **Bruce Skelly**, Meeting Events Coordinator, **Dave Rodrigues**; Director of Telescope Makers' Workshop, **Paul Zurakowski**; Director of Equipment, **Ken Swagerty**; Groups Coordinator, **Terry Galloway**; Librarian, (vacant), Astro Photo Group I/C **Bill Drelling**; Newsletter Editor/Webmaster, **Don Saito**; Board Members: **Phil Crabbe, Celeste Burrows, Alan Fisher, Conrad Jung, Gerald McKeegan, George Roush**, and Galaxy Explorer Rep, **Sophie Lee**. That's it for now! ★

## Bright, star-like galaxy???

by Mark Gingrich

The business section of the San Francisco Chronicle recently had an article about how several SF hotels were re-vamping their facilities in anticipation of increased business travel, and one item in particular caught my eye:

*The company [Personality Hotels of Union Square] also plans to break ground at 80 Ellis St. by late 2007 for a new hotel called M-31, "The name of the largest star in the galaxy," Lembi-Detert said. The company will need financing for the new property, which is one of the reasons she hired new CEO Stephen Algood this month, she said.*

Two things come to mind. Firstly, I believe there's a business opportunity here for Chabot. Why not offer a brief afternoon seminar and planetarium show to senior members of Personality Hotels' staff, instructing them as to what kind of astronomical object M-31 really is?

Secondly, as cosmically confused as they seem to be, I applaud Personality Hotels for choosing the fashionably cryptic name M-31. If they had instead named it *Messier 31*, potential guests might get the mistaken impression that the hotel's maid service wasn't up to snuff... ★

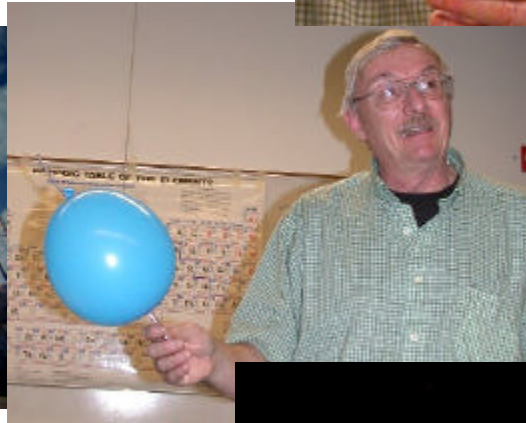


# Spare Shots ★

▶&▼ Conrad Jung (below) & Dave Rodrigues, Alan Roche, and Jim Kosinski attempt to capture Stardust reentry on film. We missed, but we did get to see it



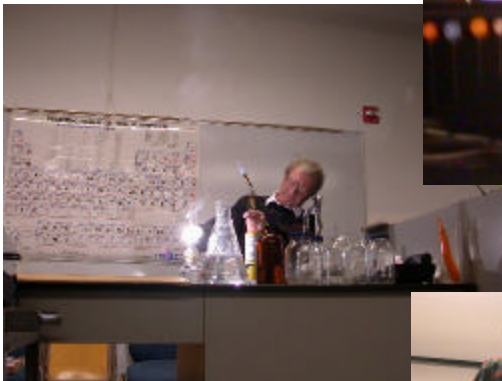
▶New Horizon mission lifts off on its 9 year trip to visit Pluto



◀&▲ Roland McLemore demos how fuses work, and molecular cohesion by stabbing a balloon with a sharp stick



▲The January EAS meeting: Things That Go Boom in the Lab!



▶Ryan Turner uses a recent super-high resolution image of the Orion Nebula from the Hubble Space Telescope to give Chabot's planetarium audiences a real "warp drive" experience



◀The WHOOSH bottle looks like a jet engine or rocket



◀The experiment was a success, but we lost the scientist (in the glare). Dr. Guertin demos more oxidating chemical substances outside (didn't want to set off Chabot's fire alarms!)

▲&▶Dr. Jaques Guertin demos oxidizing magnesium and how a sheet of paper will fall just as fast as a phone book (put the paper on top of the phone book!)





# Eastbay Astronomical Society

At Chabot Space & Science Center  
10000 Skyline Boulevard • Oakland, CA 94619

**February 2006**

*RETURN SERVICE REQUESTED*

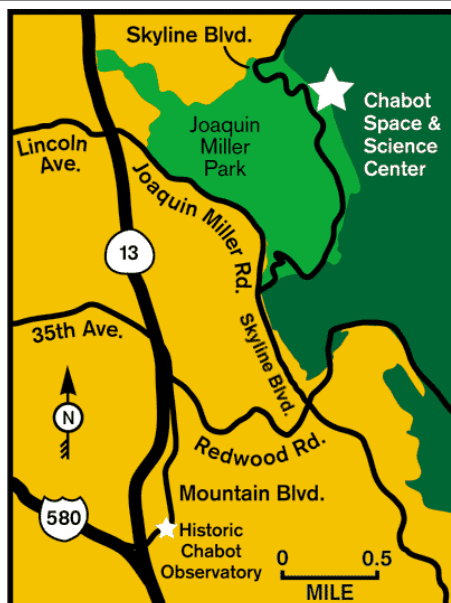
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Articles and photos for *The Refractor* are encouraged. Deadline for the March 2006 issue is February 25, 2006. Items may be submitted by mail to:  
Editor - 3514 Randolph Avenue, Oakland, CA 94602-1228. Internet email address: donsaito@comcast.net Hm: (510) 482-2913.



### FUTURE CONJUNCTIONS

- Feb 9 EAS Board Meeting, Chabot, Soda Board Rm, 7:30pm
- 11 EAS General Meeting, Chabot, Physics Lab, 7:30pm
- Mar 9 EAS Board Meeting, Chabot, Soda Board Rm, 7:30pm
- 12 EAS Annual Dinner at Chabot
- Apr 8 EAS General Meeting, Chabot, Physics Lab, 7:30pm
- 13 EAS Board Meeting, Chabot, Soda Board Rm, 7:30pm

### Join the Eastbay Astronomical Society

- Regular, \$24/year  Family, \$36/year
- Contributing, \$40/year  Student, \$15/year (digital news-)
- Sustaining, \$60/year or more letter, only)

Contact: Don Stone, EAS Treasurer  
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Sign up online at <http://www.eastbayastro.org/>