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Next Docent Meeting
June 20

The next docent meeting will be held on Monday, June 20. The meeting will convene at 6:00 in the main conference room and will feature dinner and a speaker. Docents should visit the docent forum calendar to schedule their hours for July prior to the June meeting. See the URL for the docent calendar at lower left.

Kitt Peak Docent Program

950 N Cherry Ave
Tucson, AZ 85719

Docent Forum: http://groups.yahoo.com/group/docentforum/
Docent Calendar: http://groups.yahoo.com/group/docentforum/
Volunteering at Kitt Peak:http://www.noao.edu/outreach/kpoutreach.html

www.noao.edu

KITT PEAK DOCENT

«First Name» «Last Name»
«Mailing Address»
«City» «State» «Zip Code»

Kitt Peak Docent Program

DOCENT NEWS

Number 92
June 2005

KITT PEAK DOCENT

Points of Interest:

- The docent meeting will be held Monday, June 20, featuring dinner and a presentation on the Apollo Missions by Mr. William Dupee.
- June 1: Asteroid 1999 MN near-Earth flyby at 0.052 AU.
- June 4 to 11: 15th annual Grand Canyon Star Party.
- June 8: Giovanni Cassini's 380th birthday (1625).
- June 14: Pluto at opposition.
- June 16: Moon occults Jupiter.
- June 23: Asteroid 2003 YN107 near-Earth flyby at 0.030 AU.
- June 26: Mercury passes 1.4° from Saturn and Venus passes 1.3° from Saturn.
- June 27: Mercury passes 0.1° from Venus.

For additional information about these points of interest, visit http://www2.jpl.nasa.gov/calendar/.

NEW FLOOR IN THE VISITOR CENTER

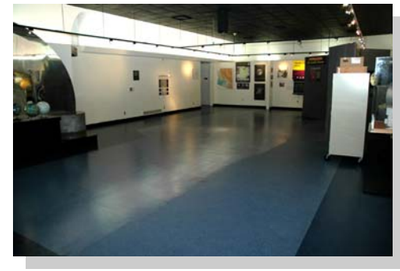
The visitor center is still in disarray but it now has an attractive blue linoleum floor that looks far better than the brown and white tile and stained carpet that previously adorned the floor. A dark blue border accents the lighter blue linoleum that covers most of the visitor center.

A sealer must be applied in three coats to prevent scratches from marring the new surface, but the contractors came up short of the liquid and are having some rushed from a supplier. Once the final coat is in place, staff can rearrange the exhibits and open the doors to the public once again.

One additional benefit of taking up the old flooring was the discovery of numerous electrical outlets that had been tiled over. It is unknown why the outlets were not left exposed but there are now more sources of electricity available for use with exhibits or for special events.

The new linoleum will be easier to care for than was the carpet and tile combination. Just a bit of buffing restores the shine and with the sealer in place stains will be less likely to set, a plus with NOP guests eating (and spilling) in the visitor center.

The next major improvement will be a coat of paint on the walls. The color has not been decided, but it will be subdued and chosen to coordinate with the floor. Just when the painting will happed has yet to be determined.



DOCENT TRAINING STARTS IN LATE JUNE

Public Outreach is gearing up for the summer 2005 docent training program. Recruitment ads are currently running on television and in the paper.

The response this year has not been as brisk as last year's tremendous response to the television ad, and most of this year's respondents state that the newspaper ad prompted their inquiry. Whichever medium sparks the interest of prospective docents, the department hopes for a substantial enrollment to compensate for the attrition suffered lately.

A number of docents who graduated from recent training classes failed to carry through with their commitment and some veteran docents have quit the program for various reasons. All together about eight docents have left the program in the past few months.

This summer's training begins on June 29th and concludes on August 22nd. As always the first day will find the group on Kitt Peak for an orientation.

The docent manual is being revised in preparation for the session and will be available on the docent forum in pdf format. The section on interpretation has been revised and an extra day added to that portion of the training. Parts of the policy and procedure section have also undergone changes, so take a look at the manual once it is posted.

LUNAR HEAVY BOMBARDMENT EXPLAINED

People of every culture have been fascinated by the dark "spots" on the Moon, which seem to compose the figure of a rabbit, frogs or the face of a clown. With the Apollo missions, scientists found that these features are actually huge impact basins that were flooded with now-solidified lava. One surprise was that these basins formed relatively late in the history of the early solar system -- approximately 700 million years after the formation of the Earth and Moon. Many scientists now believe that these lunar impact basins bear witness to a huge spike in the bombardment rate of the planets -- called the late heavy bombardment (LHB). The cause of such an intense bombardment, however, is considered by many to be one of the best-preserved mysteries of solar system history.

In a series of three papers published in this week's issue of the journal Nature, an international team of planetary scientists, Rodney Gomes (National Observatory of Brazil), Harold Levison (Southwest Research Institute, United States), Alessandro Morbidelli (Observatoire de la Cbr> d'Azur, France) and Kleomenis Tsiganis (OCA and University of Thessaloniki, Greece) -- brought together by a visitor program hosted at the Observatoire de la Cd'Azur in Nice -- proposed a model that not only naturally solves the mystery of the origin of the LHB, but also explains many of the observed characteristics of the outer planetary system.

This new model envisions that the four giant planets, Jupiter, Saturn, Uranus and Neptune, formed in a very compact orbital configuration, which was surrounded by a disk of small objects made of ice and rock (known as "planetesimals"). Numerical simulations by the Nice team shows that some of these planetesimals slowly leaked out of the disk due to the gravitational effects of the planets. The planets scattered these smaller objects throughout the solar system, sometimes outward and sometimes inward.

"As Isaac Newton taught us, for every action there is an equal and opposite reaction," says Tsiganis. "If a planet throws a planetesimal out of the solar system, the planet moves toward the Sun, just a tiny bit, in compensation. If, on the other hand, the planet scatters the planetesimal inward, the planet jumps slightly farther from the Sun."

Numerical simulations show that, on average, Jupiter moved inward while the other giant planets moved outward.

Initially, this was a very slow process, taking millions of years for the planets to move a small amount. Then, according to this new model, after 700 million years, the situation suddenly changed. At that time, Saturn migrated through the point where its orbital period was exactly twice that of Jupiter's. This special orbital configuration caused Jupiter's and Saturn's orbits to suddenly become more elliptical.

"This caused the orbits of Uranus and Neptune to go nuts," says Gomes. "Their orbits became very eccentric and they started to gravitationally scatter off each other -- and Saturn too."

The Nice team argues that this evolution of Uranus' and Neptune's orbits caused the LHB on the Moon. Their computer simulations show that these planets very quickly penetrated the planetesimal disk, scattering objects throughout the planetary system. Many of these objects entered the inner solar system where they peppered the Earth and Moon with impacts. In addition, the whole process destabilized the orbits of asteroids, which then would have also contributed to the LHB. Finally, the gravitational effects of the planetesimal disk caused Uranus and Neptune to evolve onto their current orbits.

"It's very convincing," says Levison." We have made several dozen simulations of this process, and statistically the planets ended up on orbits very similar to the ones that we see, with the correct separations, eccentricities and inclinations. So, in addition to the LHB, we can also explain the orbits of the giant planets. No other model has ever accomplished either thing before."

However, there was one more hurdle to overcome. The solar system currently contains a population of asteroids that follow essentially the same orbit as Jupiter, but lead or trail that planet by an angular distance of roughly 60 degrees. Computer simulations show that these bodies, known as the "Trojan asteroids," would have been lost as the giant planets' orbits changed.

"We sat around for months worrying about this problem, which seemed to invalidate our model," says Morbidelli, "until we realized that if a bird can escape from an open cage, another one can come and nest in it."

The Nice team found that some of the very objects that were driving the planetary evolution, and which caused the LHB, would also have been captured into Trojan asteroid orbits. In the simulations, the trapped Trojans turned out to reproduce the orbital distribution of the observed Trojans, which was unexplained up to now. The total predicted mass of the trapped objects was also consistent with the observed population.

Taken in total, the Nice team's new model naturally explains the orbits of the giant planets, the Trojan asteroids and the LHB to unprecedented accuracy. "Our model explains so many things that we believe it must be basically correct," says Mordibelli. "The structure of the outer solar system shows that the planets probably went through a shake up well after the planet formation process ended."

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June 2005

Sun	Mon	Tue	Wed	Thu	Fri	Sat
			1 Punch, Sheila	2 Need Docent	3 Doug, Pat	4 Jim O.
5 Anna, Pat	6 Richard	7 Jim M., Barbara Shaurita 20	8 Punch, Sheila	9 Larry, Gene	10 Doug, Pat Central AZ 35	11 Jim O., Eugene Strings Under the Stars
12 Anna	13 Barbara	14 Jim M.	15 Punch, Sheila	16 Gene, Barbara	17 Doug	18 Jim O. UA 95
19 Anna	20 Richard Early Bird 15 Docent Meeting	21 Joyce, Eugene	22 Punch, Sheila	23 Need Docent Pima 50	24 Doug Early Bird 12	25 Jim O.
26 Need Docent	27 Joyce	28 Jim M.	29 Punch, Sheila	30 Eugene		

MARS AND EARTH, TOGETHER AGAIN IN OCTOBER 2005

Earth is racing toward Mars at a speed of 23,500 mph, which means the red planet is getting bigger and brighter by the minute. In October, when the two planets are closest together, Mars will outshine everything in the night sky except Venus and the Moon. (You're another 50 miles closer: keep reading!)

It's only May, now, but Mars is already eye-catching. You can see it early in the morning, rising before the sun in the eastern sky, shining almost twice as bright as a 1st-magnitude star. A sky map, below, shows where to find Mars on Tuesday morning, May 31st, when it appears beautifully close to the Moon.

We won't actually lap Mars until autumn, October 31st at 0319 Universal Time, to be exact. Only 43 million miles (69 million km) will separate us from Mars, then, compared to an average distance of about 140 million miles (225 million kilometers). It's a great time to send spacecraft there.

Mindful of that, NASA plans to launch the Mars Reconnaissance Orbiter (MRO) on August 10th, 2005. Because it takes 6+ months to reach Mars, the best time to start the trip is a month or so before closest approach--thus, August. MRO will arrive in March 2006, enter orbit, and begin a 2-year mission to map the red planet in greater detail than ever before. The spacecraft's high-resolution cameras will be able to discern objects, such as rocks and rovers and crashed Mars landers, less than 1 meter across. A radar sounder will probe for underground water while spectrometers map the distribution of surface minerals. (For details, see the Vision for Space Exploration)

Dr. Tony Phillips, NASA