SIDEREAL TIMES

The Official Publication of the
Amateur Astronomers Association of Princeton

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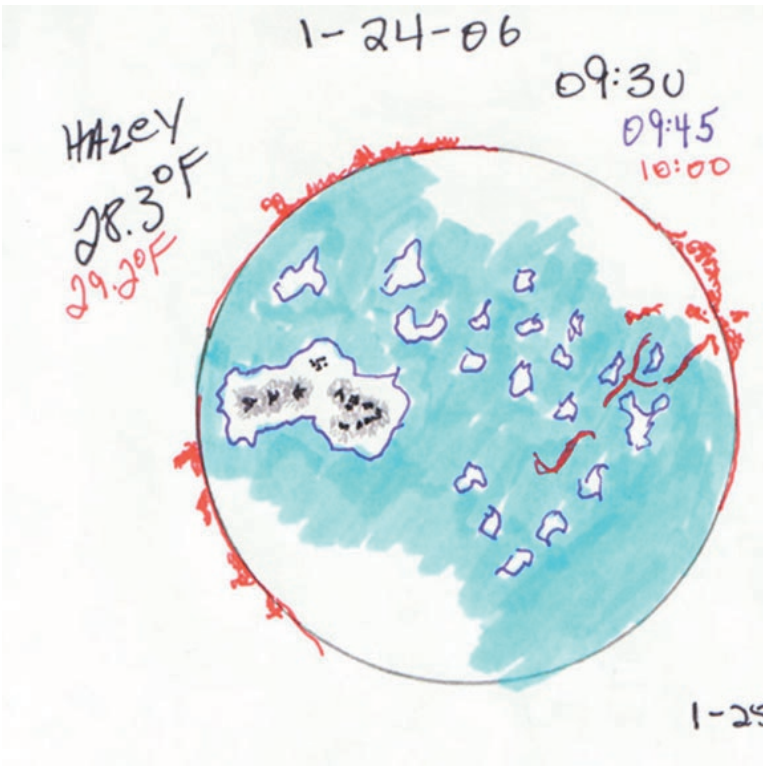
From the Director

The Ides of March and Significant Events in AAAP. Before the Ides of March (see below), we will have completed two more significant stops on the AAAP's astronomical excursion for this year. We'll hold our monthly **science lecture on Thurs March 9** (Friend Center 101, 8:00), co-sponsored by AAAP and Princeton's Dept of Mechanical and Aerospace Engineering (MAE), featuring **Dr. Marc Rayman of JPL.** He will present ***"NASA's DAWN and Deep Space-1 Missions".*** A pre-meeting dinner is planned. Please refer to Ken Kremer's article in this issue and to the AAAP website for details.

We'll follow that event by holding our monthly **club activities meeting** jointly with a **AAAP Board of Trustees Meeting on Tues March 14** (Peyton Hall, 8:00). All members are welcome to participate in this quarterly board meeting. The evening's proceedings will include a couple of members' 10 min talks, and we'll then focus on Jersey StarQuest 2006 planning. StarQuest is the AAAP's annual contribution to observational astronomy, an ideal venue for sampling the views through a large variety of amateur telescopes and related hardware. The annual StarQuest event will be held in Hope, NJ on June 23-25 (new moon weekend). Mark your calendar, and join us on March 14 to develop the plan!

Although connoting a sense of warning ever since Julius Caesar was told "**Beware the Ides of March**," the Ides expression actually refers to "March 15". In the earliest Roman calendar, perhaps devised by Romulus, months were organized around key reference days, and Ides was a term for day 15 in certain months including March. So the Ides of March are perhaps not foreboding at all, and are really the harbinger of spring and rebirth with the coming equinox!

Messier Marathon and AAAP Picnic Proposed for Sat. April 1. Mark your calendars! At the recent club meeting it was proposed that we hold our annual picnic (which was rained out back in Oct) and combine it with a Messier Marathon observing party at the club's Observatory on Sat. April 1 at Washington Crossing Park, NJ. Bill noted that there will be an unusual occultation of the moon with the Pleiades open cluster shortly after sunset that evening. From this we'll challenge ourselves to observe as many Messier Objects as possible before turning in sometime well after midnight. Keep an eye out for further plans on the club website and by e-mail.



Sketching

The above composite sketch comes from the pages of Ralph Marantino's notebook. See the Editor's Column on page 2 and the plate on page 3 for details.

Call for Volunteers! You can help your club by volunteering for the following roles (please contact me or other board members for more information):

- **StarQuest co-chair and assistants**— participate with experienced members to help plan and execute Jersey StarQuest summer astro-observing event held June 23-25.

(Director, continued on page 2)

(Director, continued from page 1)

- **Nominations chair and committee**— help identify candidates for the five board positions up for election in May: director, asst director, secretary, treasurer, and program chair.
- **Participate in upcoming public outreach/school astro events**— AAAP members can make a positive impact on the minds and future of other people, both young and more-than-young. Several public outreach events are being planned for spring and summer. Please contact observatory chair/ outreach coordinator Brian Van Liew to see where you fit in.

Dark skies! -- Rex

Deadline for the

April '06 Issue

March 31, 2006

Hans Lippersey, a Dutch eyeglass maker, is credited with the invention of the telescope in 1608. Its first application was for Naval warfare use but in 1609 Galileo turned it towards Jupiter and launch the age of telescopic astronomy.

From the Editor

Sketching Though astrophotography is very popular amongst amateur astronomers particularly since CCD cameras have come into a price range that many can afford, I have always encouraged sketching in my Fall course offering at the Nature Center. I also have to admit to being a bit of a charlatan because I do not sketch myself. Never-the-less, sketching adds much to the experience of our hobby because these renderings are what we really see through the eyepiece and can be displayed as an example to others of what to look for. This is in stark contrast to the product of astrophotography, which is what the camera and not what the eye sees. My favorite observing guides are those that feature numerous sketches and not just photos.

Several members of AAAP have mastered this art form over the years. Three of these members are; Past Director, Jay Albert (now retired and living in Florida), Ron Mittlestaedt, both specializing in Deep Sky Objects, and Ralph Marantino who has done a monumental effort in Solar sketching. From time to time Ralph brings in his volumes of Solar sketches but up to now Ralph's work has been in white light and the H-alpha spectral band. Recently he has acquired a Calcium K-Line telescope and now his efforts include three bands. Coronado admits they designed this telescope with imaging in mind because many people's vision at the far blue end of the visible spectrum is poor and yields less than a satisfying visual experience. This has not proven to be an impediment to Ralph as his sketches testify. The plate at the right (on page 3) shows a page from his sketch books completed during January. Each sketch is a composite of the views seen through three separate telescopes. The red is H-alpha, the blue from his new Calcium K-Line, and the overall background from his standard white-light Solar filter. Unfortunately the Sidereal Times is printed in black and white so this description is lost, however, it is recommended that everyone go to the AAAP website and download the .pdf edition and see the prominences depicted in red and the calcium K-Line depicted in blue.

The sketches were done viewing through a Coronado Solarmax 70mm Calcium K-Line Telescope and a Coronado CEMAX 12mm eyepiece by Ralph. The interference filter is tuned for 393.4 nanometers (blue) and has a 2.2 Angstrom bandpass. Ralph's Tri-Band Solar Observatory is shown in the accompanying photo and can also be seen in color on the AAAP website in the feature, 'Members and Their Scopes."

Vic

1-24-06

09:30

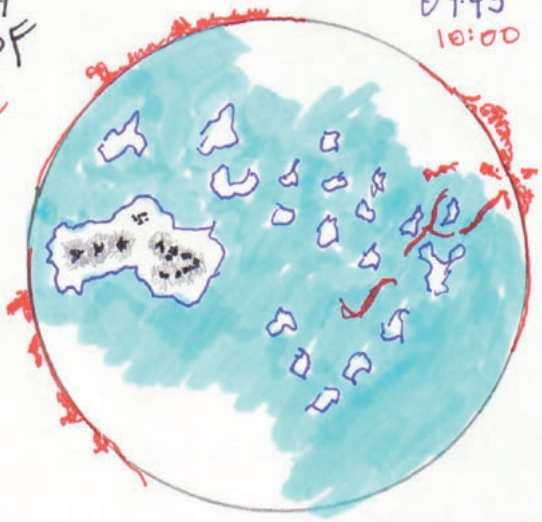
09:45

10:00

Hazey

28.3°F

29.2°F



1-25-06 .5A

09:20

Hazey

36.3°F

1-25-06 09:30

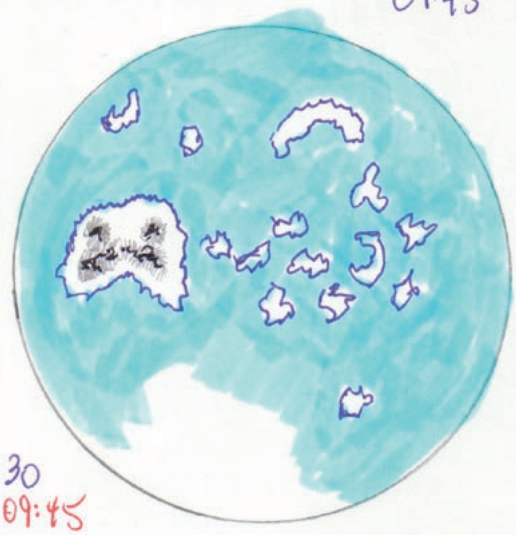
09:45

70MM

2.2A CALCIUM K

Hazey

36.5°



Poor H-Alpha Seeing!

1-27-06

20.1°F

windy

09:30

09:45

10:40

2.2A

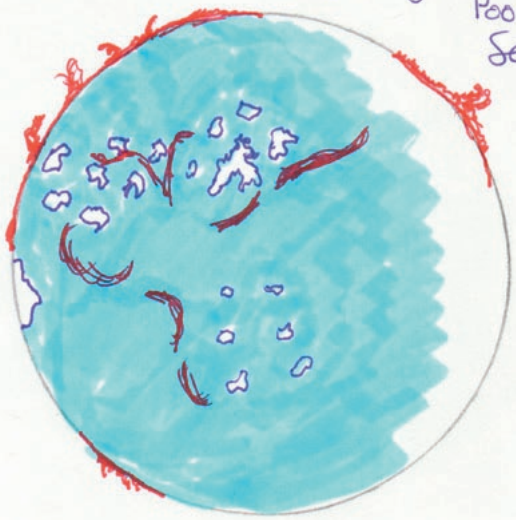
1-28-06

36.5°F

very Hazy

10:25

Poor Seeing



Science Outreach and Exploration Update

Science Outreach

Riverside Elementary School: Princeton, NJ, Fri, Mar 3, 7 PM. Blizzards and rain have so far postponed this upcoming astronomy fair for eager 3rd graders which will feature my Mars educational presentations and AAAP telescope viewing. Last year we enjoyed an exciting evening with the students and their wonderful teachers.

Rockland Astronomy Club (RAC): Blauvelt, NY, Sat, March 4, 2006 at 7 PM. Postponed by the Blizzard of 2006 from February to the first Saturday in March. The Rockland club has kindly invited me to be the guest speaker at their annual dinner meeting. My presentation on "*Mars, Saturn, Comets and Beyond!"* will highlight Spirit and Opportunity celebrating 2 years on the Red Planet, the Cassini Mission to Saturn and its many intriguing moons, and journeys to Comets, Pluto and Beyond!

Website: http://www.rocklandastronomy.com/

Delaware Valley Astronomical Association (DVAA): Plymouth Meeting, PA, Fri, Mar 10, 2006 at 7:30 PM**.** The club leaders have invited me to talk on *"Exploring Mars and the Search for Life*" with a strong recommendation from the Rittenhouse Astronomical Society **(**RAS). Open to the public. Website: http://dvaa.org/php/page.php?body=Events

Science and Engineering Expo (Middle Schoolers): Princeton University, NJ, Tue, Mar 21, 2006 from 9 AM to 2 PM. This day long University sponsored science fair (**SEE Princeton**) is dedicated to capturing the imaginations of more than 1000 middle school students from local schools. Students will interact with scientists and engineers from Princeton University and the local area to explore science with the help of demonstrations and hands-on activities. I will give astronomy presentations throughout the day on *"Twin Rovers Exploring Mars*." AAAP members may contact me if interested to help with an astronomy demo table.

Website: http://www.princeton.edu/~pccm/outreach/seeprinceton.htm

New Jersey Astronomical Association (NJAA): Paul Robinson Observatory, High Bridge, NJ, Sat, Mar 25, 2006 at 8:30 PM**.** The NJAA has invited me to present *"Exploring Mars and the Search for Life*" *and journey to "Mars and Saturn in 3D".* 3D glasses will be provided. Open to the public.

Website: http://www.njaa.org/

Washington Crossing State Park: Interpretive Center, Titusville, NJ. Sun, April 2 at 1:30 PM. All are welcome to attend my presentation on *"A Tour of Our New Solar System"* to experience the beautiful and amazing new discoveries in our Solar System at Mars, Saturn, Pluto, Comets, the new 10th *"Planet"* and more. Open to kids of all ages 4 to 84. The program will include a non-technical illustrated presentation, display, 3-D pictures, hands-on activities and take home materials.

Weather permitting, AAAP member Ralph Marantino will be setting up the BOB-O-SCOPE for the "*best"* Solar Telescope Viewing in the Northern Hemisphere, courtesy of Barlow Bob. Ron Mittelstaedt has also volunteered to thrill the kids with his solar scope.

Website:http://www.state.nj.us/dep/parksandforests/parks/washcros.html

NEAF Northeast Astronomy Forum: Suffern, NY, May 6-7. Check out the RAC website for a prestigious group of speakers. Barlow Bob is organizing the Solar Star Party with help from Ron Mittelstaedt and Ralph Marantino. RAC has invited me back for solar system presentations and displays.

http://www.rocklandastronomy.com/neaf.htm

Mohawk Valley Astronomical Society (MVAS): Clinton, NY**.** Our good friend Barlow Bob called me to report that at MVAS meetings, the members enjoy reading through his printed collection of recent Astronomy club newsletters, including the *Siderial Times*. He reports that they learn a lot by discussing the highlights and they also enjoy my Public Outreach and Science Mission Updates reported herein.

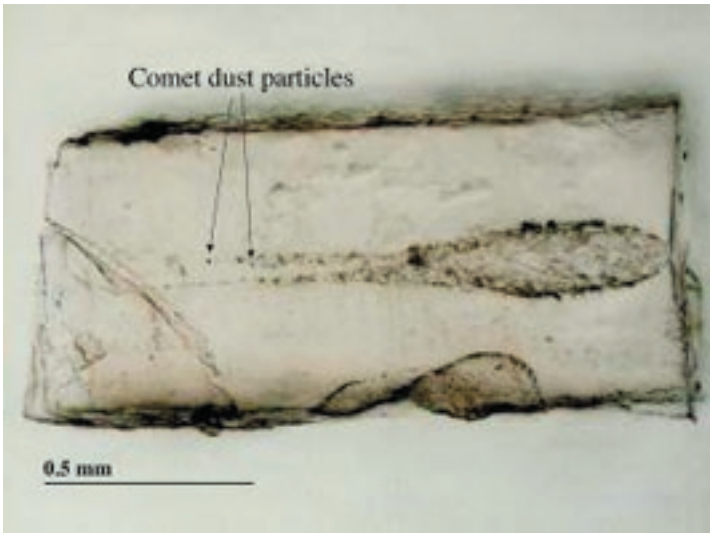
For science outreach presentations please contact me at Email**:**

Outreach for AAAP, JPL and The Planetary Society

Ken Kremer

Robotic Mission Exploration Update

Stardust Comet Sample Return: Detailed scientific analysis of the cometary dust particles returned by the Stardust capsule on January 15 has begun. It is estimated that over a million particles greater than 1 micron in size were collected from Comet Wild 2 during a flyby in January 2004. They are believed to be virtually unchanged specimens from the formation of our solar system, 4.5 billion years ago. Preliminary indications from the limited samples so far extracted (see photo below) for examination show a surprising lack of water, but they do contain components such as sulfides, iron, olivine and glassy materials. Stardust continues to fly through space and may be retargeted to encounter Comet Temple 1 around February 2011 and examine the crater formed by the comet smashing Deep Impact spacecraft last summer.



Stardust Aerogel closeup: Comet dust particles

Spirit and Opportunity on Mars: Spirit is intensively studying the beautifully layered outcrops at the circular feature nicknamed

(Update, continued on page 5)

(Update, continued from page4)

"Homeplate", reached in early February and dubbed a "spectacular mystery" by Principal mission scientist Steve Squyres. Spirit is climbing up the 260 foot wide feature while the team is trying to determine if it formed via volcanic ash, impact ejecta, water alteration, wind erosion or an altogether different mechanism.

Cornell Professor Jim Bell, the rover panoramic camera leader, told me that Spirit is "poking around at the layers, trying to figure out the chemistry and geology. Layered/altered ash deposits are a good hypothesis, but there are also ideas about impact surge deposits or aeolian deposits floating around." He added "We make hypotheses and then test them. We'll work it out, but it won't be "instant."

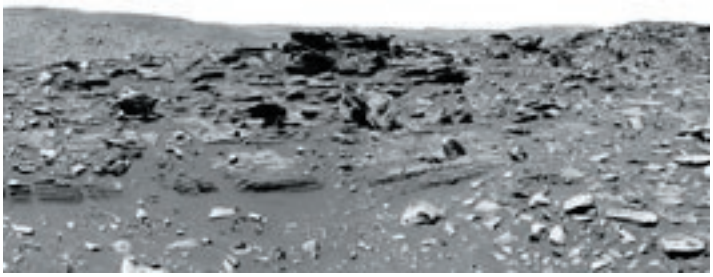
Another concern for Jim and the team is maintaining sufficient power from the solar arrays which is essential for Spirit to survive. Spirit is in a race against time to reach the north facing slopes of nearby McCool Hill before winter arrives. Therefore, he said "we can't stay at Home Plate for much longer. Maybe a week, maybe 10 days. If it's worth it to come back after we pass winter solstice, we'll come back, though. Still lots of discussion/debate needed to go into those kinds of decisions..."

Both rovers continue to function extremely well, although the hoped for drive to Victoria Crater by Opportunity continues to be delayed by the balky robot arm.

Jim Bell's specialty on the mission is the rover panoramic cameras, which have lasted well beyond their design lifetime and not degraded in performance. They are actually holding up much better than he expected despite aging and the intense daily bombardment of cosmic rays. He told me that "they are not intentionally shielded, but of course the housings, camera bar, electronics boxes, etc. provide some passive shielding naturally. That certainly helps."

Jim has produced a dramatic new movie from Opportunity showing Earth and Jupiter rising in the eastern skies above Meridiani Planum on the morning of Sol 687 (29 Dec 2005) with some wispy high-altitude clouds passing in the distance.

In the Fall of 2006 AAAP lecture season, Jim will present the story of Astrophotography from the surface of Mars.



Spirit: Spectacular layering at "Home Plate"

IMAX Film *"Roving Mars":* This movie which premiered in January, details the amazing adventures of the rovers on the surface of Mars and is playing at the IMAX Theater in NYC. View the trailer at:

http://disney.go.com/disneypictures/rovingmars/index.html

Mars Reconnaissance Orbiter (MRO): NASA's next Mars mission is on final approach with arrival on 10 March, about when this newsletter appears. Success hinges on firing the main engines for about 27 minutes to achieve an initial elliptical orbit. Six powerful science instruments are on board which will comprehensively study the planet from the underground layers to the high atmosphere.

Mars Express (ESA): The spacecraft has spotted evidence of auroras over the night side of Mars which apparently arise from ancient magnetic regions. As on earth, they make v-shaped structures of accelerated electrons and ions colliding with the upper atmosphere. The discovery is a surprise since Mars lacks an intrinsic planetary magnetic field.

Venus Express Orbiter (ESA): In a critical test, the spacecraft successfully fired its main engine for the first time in space on 16 February to prepare for the key orbital insertion burn on 11 April 2006. The main engine must fire for about 51 minutes to *"brake"* the spacecraft for capture in orbit around Venus.

Cassini/Huygens (NASA/ESA): Giant lightning storms have been detected on Saturn by the spacecraft since late January. Amateur astronomers have coincidentally photographed recent saturnian storms, including AAAP members Brian van Liew and Bob Vanderbei as they reported at the 14 February AAAP monthly meeting.

The Cassini science team has created a new global infrared map and rotation movie of Titan, based on the last 3 flybys, which vividly displays the dynamic atmospheric weather patterns and exciting geology of this active moon.

http://photojournal.jpl.nasa.gov/catalog/PIA02146

In photo below, Cassini looks toward the darkened night side of Saturn to capture the eerie glow of the rings. Since they are not being blocked by the planet's bulk, the rings remained brilliant in full sunlight while the spacecraft gazed at a distance of 178,000 miles from Saturn.

Rings against dark Saturn

This Cassini view, along Saturn's ringplane, shows three moons aligned in a row on January 2, 2006 from a distance of 1.7 million miles: Dione (700 miles across) at left, Prometheus (63 miles across, center) and Epimetheus (72 miles across) at right.

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(More News, continued from page 5)

Three Moons in a row from the Ringplane

DAWN (Asteroid Orbiter): Dr. Marc Rayman of the Jet Propulsion Lab (JPL) is our March keynote speaker. He serves as the chief engineer on the DAWN mission to orbit the two most massive asteroids, Ceres and Vesta, a feat only made possible utilizing exotic ion propulsion techniques. Ceres has a water ice-rich mantle and a tenuous atmosphere whereas Vesta is rocky, oddly shaped and lacks a South Pole! These mini-planets are inclined at 11 and 7 degrees to the ecliptic, respectively, and underwent different evolutionary paths.

In a telephone interview, Marc told me that "the DAWN spacecraft was more than 90% complete" after his recent inspection of the spacecraft, currently being assembled at Orbital Sciences in Virginia. He said "the scientific instruments have been fully built and delivered and simply await integration with the spacecraft bus. The launch window extends to at least October 2007, much longer than for conventional missions."

After launch, "a Mars gravity assist flyby is planned at a distance of 500 km of the surface where the visible and infrared cameras and other science instruments will be utilized for science investigations." DAWN spans 20 meters across, mostly due to the large solar panels. He told me that "the ion engine is a *power hog* that will require 550 watts to operate at the 3 AU encounter distance," nearly ½ of the total electrical output of the solar array. Marc added that "after launch and at 1 AU the output is 10 KW, but drops to 1.2 KW at 3 AU." The energy is used to power the ion engine which then ionizes the Xenon gas propellant. The thruster "emits Xe+ and is adjustable at 112 discrete throttle levels, unlike most propulsion systems. The ion trail will be visible for about 1 meter or so."

Marc Rayman (JPL, right) and Ken Kremer (AAAP) discuss DAWN Asteroid Orbiter propelled by Ion Engine (foreground) at JPL, Pasadena, Ca

"DAWN will have the highest energy output of any *Deep-Space* mission" and is among the most distant spacecraft to rely on solar power.

More News

Pluto's New Moons Confirmed: The recent discovery of 2 new moons at Pluto has been confirmed with new images taken by the Hubble Space Telescope on Feb 15. The results are reported in the Feb 23 issue of *Nature* by a team led by Dr. Hal Weaver of Johns Hopkins University Applied Physics Laboratory. This establishes Pluto as the first Kuiper Belt Object with multiple moons. Dr Alan Stern, principal investigator for the New Horizons mission to Pluto, writes in a companion paper that these tiny moons were most likely created in the same collision which created Charon and that there also may be a ring system.

Planets Orbiting Backwards: NASA Astronomers studying the swirling disk of material of a newly forming solar system have found that the inner disk is rotating in one direction while the outer disk orbits in the opposite direction. This is the first such finding.

Black Hole Population: New data from the orbiting Chandra X-ray observatory show that the galactic population of black holes is far higher then previously thought.

Websites for daily updates/perspectives:

http://marsrovers.jpl.nasa.gov/home/index.html
http://www.esa.int/export/SPECIALS/Mars_Express/index.html
http://saturn.jpl.nasa.gov/home/index.cfm
http://www.esa.int/SPECIALS/Cassini-Huygens/
http://deepimpact.jpl.nasa.gov/
http://pluto.jhuapl.edu/index.php
http://www.esa.int/SPECIALS/Venus_Express/index.html
http://www.planetary.org/
Email:

Ken Kremer

From the Program Chair:

Upcoming 2006 AAAP lecture season and events:

March 9 (THURSDAY): A **Special Science Lecture** by Award Winning Scientist and Princeton University Alumnus ('78 Physics) **Dr. Marc Rayman** from the Jet Propulsion Lab in Pasadena, Ca. The talk is jointly sponsored by AAAP and the Mechanical and Aerospace Engineering Department (MAE) of Princeton U and will be held at 8 PM at the Friend Center of Princeton University on William Street. His talk is titled *"NASA's DAWN and Deep Space 1 Missions: To Boldly Go -- well, you know ... (Adventures in the Solar System)"*. Dr Rayman is the Chief Engineer for the missions.

NASA's Deep Space 1 mission, launched in 1998, tested 12

(Program, continued on page 7)

(Program, continued from page 6)

high-risk, advanced technologies needed to enable future space science missions. Among the exotic systems tested were ion propulsion and artificial intelligence. The 11-month mission was so successful that NASA extended it, and the flying laboratory was converted to a comet explorer. Two years later, Deep Space 1 conducted an extremely ambitious and risky but flawless encounter with Comet Borrelly, returning the best pictures that had ever been taken of the nucleus of a comet. Dawn is one of the beneficiaries of Deep Space 1. Scheduled for launch in 2007, it will use ion propulsion to undertake a mission far beyond the capability of conventional propulsion systems. Dawn will study the two most massive asteroids, Ceres and Vesta, which are among the last unexplored worlds in the inner solar system. Comparing these two bodies should reveal much about the dawn of the solar system. Dr. Rayman will provide an overview of these two missions as well as the excitement of flying spacecraft through the solar system.

Dr. Rayman has worked at NASA's Jet Propulsion Laboratory for nearly 20 years and his work at JPL has spanned a wide range of projects, including optical interferometry missions for detecting extrasolar planets, a laser altimeter for use at Mars, the Spitzer Space Telescope, Mars sample return, and laser communications for planetary spacecraft. He worked on Deep Space 1 (DS1) from its conception to its conclusion and now is the chief engineer on the Dawn project. Dr. Rayman is the recipient of many awards, including two NASA Exceptional Achievement Medals, and he is the only person to have won both the Exceptional Technical Excellence award and the Exceptional Leadership award, JPL's highest honors. He has also been very active in NASA's education and public outreach, particularly with his popular DS1 blog (http://nmp.jpl.nasa.gov/ds1/archives.html) and his work with the educational website The Space Place (http://spaceplace.nasa.gov. His work on DS1 and his thoughts about spaceflight were featured prominently in the Discovery Channel's Deep Space One documentary.

NOTE: DATE and LOCATION CHANGE. This special lecture will be on a **Thursday** at the **Friend Center Room 101 on William Street**, a very short walk from the parking lot behind Thomas Sweet (see map). Lots of parking along William and Olden Streets and the campus lot on William Street. The March 9 lecture is listed on MAE website:

http://mae.princeton.edu/events/2006/01/e180/mae_seminar.html

April 11: Prof. Robert Nemiroff of Michigan Technological University is the co-founder/author of the *"Astronomy Picture of the Day"* website. He will present *"Astronomy's Best Images -- As Subjectively Selected by the Editors of Astronomy Picture of the Day."* Some of the most spectacular images of any sort in modern times have been of space. From the red rock plateaus on Mars to the magnificent desolation of the Moon to monster-shaped nebula in deep space, astronomy images continue to excite the imagination, inspire curiosity, and challenge description. Many of these images have appeared on the popular web site Astronomy Picture of the Day (APOD) at http: //apod.nasa.gov/ . After reviewing the entire archive, APOD's editors have selected some of their all time favorite APOD's. These images will be presented along with stories behind them and a running educationally oriented commentary. Dr. Nemiroff is the co-author (w/ J. T. Bonnell) of the books *"The Universe: 365 Days"* and *"Astronomy: 365 Days"* (due out Summer 2006).

May 9: Distinguished Prof. Michael A'Hearn from U. Maryland is the Scientific Principal Investigator for the Deep Impact mission to Comet Temple 1. Deep Impact successfully smashed into the comet on July 4, 2005 and Prof A'Hearn will tell the first hand mission story.

On February 14, **Prof. Mary Lou West** of Montclair State University (MSU) presented a well received talk on the celestial mechanics of *"How Things Move in Space"* with a little help from inquisitive young minds (see photo below). There was a lively discussion on *"What's the definition of a Planet"*. She sponsors an amateur club, the North Jersey Astronomical Group (www.njastro.org), at MSU.

James and Jeziah Johnson demonstrate celestial motion with Prof. Mary Lou West, AAAP speaker on Feb 14.

Please send me your suggestions for speakers, with contact/topic information.

Email:

Ken Kremer

Special Science Lecture

Announcement

Dr. Marc Rayman of the **Jet Propulsion Lab**

March 9, THURSDAY, 8 PM

AAAP/Princeton U (MAE) Joint Sponsorship

Location:

Friend Center Room 101 on William Street

"NASA's DAWN and Deep Space 1 Missions: To Boldly Go - - well, you know …. (Adventures in the Solar System) "

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“NASA’s DAWN and Deep Space 1 Missions"

See us on the Web: www.princetonastronomy.org

March 2006

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