

# Goddard View

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## STEREO Observatories Presented to Goddard Employees

By Rachel Weintraub

Get ready to go where few Goddard employees have gone before. As the Solar TERrestrial RELations Observatory (STEREO) nears its Summer 2006 launch date, the project personnel are providing a unique chance to let fellow employees see and learn about the spacecraft, launch operations and its mission to image the sun and solar wind in 3-D.

On Friday, March 31, employees will have the rare opportunity to observe the mission's two nearly identical observatories while they are at Goddard for the last round of testing. And if you've ever driven by the huge Building 7, 10 and 29 facilities and wondered what goes on in there, here's your chance to tour the facilities, including the HST cleanroom, centrifuge, as well as the vibration, acoustic environmental and acceleration test facilities.

A unique two-year mission, STEREO will be the first to image the sun and solar wind in 3-D. The new view is critical to improving scientists' understanding of space weather and its impact on Earth and its satellites, communications and power systems. Two nearly identical observatories—one ahead of Earth in its orbit, the other trailing behind—will trace the flow of energy and matter from the sun to Earth as well as reveal the 3-D structure of coronal mass ejections (CMEs).

Solar flares and CMEs are the most powerful explosions in the solar system, with the potential to blast billions of tons of plasma into space at a million miles per hour. These events are extremely hazardous to astronauts when outside of the relatively protected Space Shuttle and International Space Station, or traveling out to the moon or Mars. ■



Caption: STEREO spacecraft rest side-by-side in the Goddard cleanroom.

Photo credit: Chris Gunn

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Cover caption: An engineer looks on as the stacked STEREO spacecraft undergo a spin balance test.

Image Credit: Chris Gunn

## GoddardView Info

Goddard View is an official publication of the Goddard Space Flight Center. It is published bi-weekly by the Office of Public Affairs in the interest of Goddard employees, contractors, and retirees. A PDF version is available online at:

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Deadlines: News items and brief announcements for publication in the Goddard View must be received by noon of the 1st and 3rd Wednesday of the month. You may submit contributions to the editor via e-mail at [alittle@pop100.gsfc.nasa.gov](mailto:alittle@pop100.gsfc.nasa.gov). Ideas for new stories are welcome but will be published as space allows. All submissions are subject to editing.

## Goddard Employees Who Keep Snoopy in Mind

By Trusilla Steele

Several Goddard employees are recipients of the Space Flight Awareness (SFA) Silver Snoopy Award. Of all the SFA awards, the Silver Snoopy best symbolizes the intent and spirit of Space Flight Awareness. An astronaut always presents the Silver Snoopy because it is the astronauts' own award presented to those exhibiting outstanding performance and contributing to flight safety and mission success. It is always a special honor to receive this award, in fact, less than one percent of the space program workforce receives it annually.

Yes, this award is named after the famous beagle from the Peanuts comic. The concept of using Snoopy was established as an effort to incite consciousness of flight safety and quality performance in the space program. NASA wanted to develop a symbol to reiterate the importance of flight safety and mission success and since Snoopy is a popular public icon, NASA approached Charles Schulz, the creator of the Peanuts, for his permission to use Snoopy and to create "Snoopy the astronaut." An avid supporter of the U.S. space program, Mr. Schulz enthusiastically welcomed the idea.

Individuals selected for the award receive the specially designed sterling Silver Snoopy lapel pin, a letter of commendation, and a certificate presented by a member of the astronaut corps.

Among the selection criteria, employees (not generally given to management personnel) must have significantly contributed to Shuttle, Space Station or payload programs by:

- Achieving beyond their normal work output
- Attaining a particular program goal
- Contributing to a major cost savings or series of lesser cost savings
- Being instrumental in developing modifications that increase quality, reliability, safety, efficiency or performance
- Assisting in operational improvements that increase efficiency or performance
- Being a key player in developing a beneficial process

Astronauts John Grunsfeld and Michael Massimino presented Silver Snoopy awards to the following Goddard recipients in February 2006 during the Space Flight Awareness Special Recognition Event:

### **Curtis Fatig/Code 444 SAIC**

Acknowledged for his outstanding leadership of the Hubble Space Telescope (HST) testing in support of Servicing Mission 3B.

### **Heather Franz/Code 444 AISOL**

Commended for her exemplary mission design leading to the safe GRO re-entry and splashdown.

### **Steve Slojkowski/Code 444 AISOL**

Outstanding contributions to the Flight Dynamics Facility's human space-flight software modification, which helped ensure the continued success and safety of STS rendezvous missions with the International Space Station.

### **Steve Thorpe/Code 444 AISOL**

Commended for his dedication in achieving Shuttle mission success on STS-86 and STS 98.

### **Holly Offerman/Code 540 SWALES**

Recognized for her outstanding contributions to improvement of operations for the Flight Dynamics Facility's Space Transportation System Flight Team.

The following employees did not receive the Silver Snoopy Award but were recognized by their peers for their outstanding achievements:

### **Shawn Belton – L3 Communications GSI**

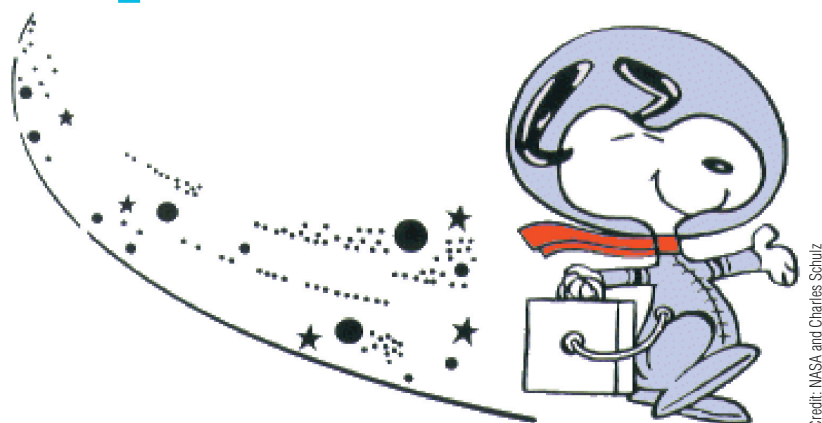
### **Dr. James Cappellari – Honeywell Tech. Sol. Inc.**

### **Kenneth Clark – Caelum Research Corp.**

### **Robert Dedalis – GSFC/Code 302**

### **John Kolasinski – GSFC/Code 565**

### **Lesley Rahman – Honeywell Tech. Sol. Inc.**



Credit: NASA and Charles Schulz

## Goddard's Stardust Factory Solves 25-Year-Old Mystery of Impossible Dust

By Bill Steigerwald

Something takes over scientists when they see what they think is impossible. Like a cat that got stuck in a box because it just had to see what was inside, they can't help themselves. So when Goddard's Dr. Joseph Nuth saw stars making dust at "impossibly" high temperatures, he fired up a stardust factory to see if something was missing.

He wasn't motivated by idle curiosity – understanding this process helps us understand our origin. This dust will become part of another generation of stars and planets, just as previous generations of stars contributed dust grains into our solar system that at least on one planet led to life.

Dying stars heat up internally while expelling their outer layers of gas into space. The gas expands and cools, allowing some matter in it to condense into dust grains. Observations over the last quarter century show dust grains made of silicon and oxygen (SiO or amorphous silicate grains) condensing at 1,300 degrees Fahrenheit (more than 700 degrees Celsius) in the billowing clouds of gas (nebulae) surrounding old stars.

The prevailing theory said that this temperature was too high to condense solid silicate grains – the silicon and oxygen should have remained in the gas. "Even though theory said it was impossible, stars made dust grains at high temperatures anyway – it was happening right before our eyes," said Nuth, lead author of a paper on this research recently submitted to the *Astrophysical Journal*. "So we went to our laboratory at Goddard where we vaporize material in a vacuum and observe how it condenses to see what we were missing."

The experiment revealed that the "vapor pressure" at which the dust grains condense was too high in the theory.

The pressure at which the SiO gas starts to condense is called its saturated vapor pressure – like 100 percent humidity for SiO gas. The experiment revealed that the actual value at 1,300 degrees F was about 100,000 times lower than what was predicted by the theory. The lower actual value means that SiO gas can form dust grains in a 1,300 degree-nebula at concentrations about 100,000 times lower than previously believed. "If weather forecasters had made a similar prediction about the vapor pressure for water, they would say rain was impossible – they would think there was never enough water in the air to make it rain," said Nuth.

"We plugged the actual, lower saturated vapor pressure values from our experiment into the theory, and it was almost good enough. The modified theory predicted that the SiO gas was very close to condensing into dust grains, but there was still some factor missing," said Dr. Frank Ferguson of the Catholic University of America, Washington, Co-author of the paper. According to the researchers, the missing factor was that the SiO molecules can lose energy by radiating it out into space.

Molecules can vibrate at different levels, each with more energy than the one below, until, at the highest vibrational levels, they have so much energy that they just break apart. Many of the SiO molecules in the nebula are in low-energy vibrational states, so they can condense at a slightly higher temperature than their vapor pressure alone indicates because these molecules are cooler than the surrounding gas.

"When we use the new vapor pressure and account for the vibrational levels of the SiO molecules in the expanding gas, silicate dust condenses easily," said Nuth. "This result shows how experiment, observation, and theory all complement each other in the search to understand what really happens in nature."

For more information please visit:

[http://www.nasa.gov/centers/goddard/news/topstory/2006/stardust\\_factory.html](http://www.nasa.gov/centers/goddard/news/topstory/2006/stardust_factory.html)

### Did You Know?

#### Medical Testing:

Thanks to NASA's "camera on a chip" technology, doctors can test bone density in 30 seconds.

## Themis Mission to Study Northern Lights

By Cynthia O'Carroll and Amy Pruet

On a clear, dark night in Alaska, Canada or the Northern United States, you may see a shimmering band of light, called the Northern Lights or the Aurora Borealis, stretching across the sky from the East to the West. Similar lights occur near the South Pole and they are known as the Southern Lights or the Aurora Australis.

Researchers know that these shimmering light shows are generated by showers of high-speed electrons descending along magnetic field lines in the upper atmosphere. The electrons create an oval around Earth's magnetic poles that spark colored lights as they hit the atmosphere. But now scientists want to learn where in the magnetosphere the energy of the solar wind transforms explosively into auroras and how they are formed.

With NASA's Time History of Events and Macroscale Interactions during Substorms (THEMIS) mission, scientists will embark on a revolutionary journey to study the iridescent Northern Lights. During this 2-year mission, five identical probes will track these violent, colorful eruptions near the North Pole. These substorms are linked to energy releases in Earth's magnetosphere and their trigger mechanism has remained a scientific mystery until now. Previous single-spacecraft studies of Earth's magnetosphere and space weather have been unable to pinpoint the origin of these substorms.

"There are few more awe inspiring sights than the colorful and dynamic beauty of the Northern Lights," remarked Frank Snow, Goddard THEMIS

Project Manager. "THEMIS is a challenging project employing five satellites, 25 scientific instruments and 20 ground observatories that will replace old myths with scientific explanations for a spectacular light display - visible evidence of Earth's atmosphere protecting us from the fatal effects of the Solar wind."

**When the five identical probes align over the North American continent, scientists will collect coordinated measurements along the Sun-Earth line, allowing the first comprehensive look at the onset of substorms and how they trigger auroral eruptions. Over the mission's lifetime, the probes should be able to observe some 30 substorms – sufficient to finally know the origin of these substorms. "Substorm processes are fundamental to our understanding of space weather and how it affects satellites and humans in space," says Vassilis Angelopoulos, THEMIS Principal Investigator at UC Berkeley's Space Sciences Laboratory.**

Each of the five probes will carry the same set of five low- and high-frequency magnetic field and electric field instruments as well as thermal and super-thermal ion and electron detectors, for a total of 25 instruments in all.

When the probes align perfectly over the North American continent— every four days for about 15 hours – 20 ground stations in Northern Canada and Alaska with automated, all-sky cameras will document the auroras from Earth. This will give scientists the first comprehensive look at the phenomena from Earth's upper atmosphere to far into space. In addition, research-grade magnetometers have been placed in 11 rural schools in the Northern United States to monitor the large-scale effects of the currents in space. These educational and scientific instruments are bringing the excitement of space research right into the classroom.

THEMIS is a NASA-funded mission managed by the Explorers Program Office at Goddard Space Flight Center in Greenbelt, Md. The Space Science Laboratory at the University of California at Berkeley is responsible for the project management, science instruments, mission integration, post launch operations and data analysis. Swales Aerospace of Beltsville, Md., manufactured the THEMIS spacecraft bus.

The THEMIS mission is targeted for launch in the fall of 2006 aboard a Boeing Delta II launch vehicle from Cape Canaveral Air Force Station, Fla.

More information please visit:

<http://www.nasa.gov>

<http://sprg.ssl.berkeley.edu/THEMIS/> ■



Photo credit: Jan Curtis

Caption: 06 November 2000 at 6:22AM from Fairbanks, Alaska. Very rare pre-dawn red aurora (facing west).

## NASA Scientists Use Satellite Imagery to Track Bird Migration and Avian Diversity

By Amy Pruett

Apparently, science has gone to the birds, but in a good way, as Dr. James A. Smith related during his “Eyes on the Sky” lecture at the NASA Goddard Space Flight Center Visitor Center on Thursday, Mar. 16. He discussed Goddard’s recently developed role in tracking and predicting bird migration and avian diversity by way of satellite imagery.

With increased public interest in birds because of rising concerns about the avian flu and the impact natural disasters such as Hurricane Katrina have had on avian fauna, scientists no longer view bird watching as an option, but a necessity. And, typical of NASA scientists’ style, they are upping the ante as binoculars have been traded in for high-tech devices and innovative procedures.

Dr. Smith, and Postdoctoral students Dr. Konrad Wessels and Dr. Jill Deppe at the U.S. Geological Survey and the U.S. Fish and Wildlife Service, are building biophysical models of birds and using the animals’ physiology and biology to predict their migration patterns throughout North America. Using climate models to derive wind and temperature and satellite images to reveal food quality, the scientists learn key information about the distribution of birds on the planet.

Armed with their knowledge, they can mimic the migration strategies and decisions of a given species, to fly a population of individuals across the North American flyways, and to explore the consequences of changes in the landscape on the long-term fitness of the population, all without having to track them 24 hours a day, 7 days a week, which saves time and effort.

The innovative work of Dr. Smith and his colleagues at Goddard has become an essential science as birds are adapting just like their ever-changing environment that scientists strive to understand.

Dr. Smith is also an Adjunct Professor in the Department of Information Systems at the University of Maryland at Baltimore County. ■

## Proposal Opportunities

### Research Opportunities in Space and Earth Science (ROSES)

Chandra X-Ray Observatory – Cycle 8 Call for Proposals

Released: 2005-12-16

Proposal Due: 2006-03-16

Discovery Program 2006 and Missions of Opportunity

Released: 2006-01-03

Proposal due: 2006-04-05

For more information contact the New Opportunities Office  
x6-5442

## NASA Deputy Administrator Shana Dale Speaks on “Women: Builders of Communities and Dreams”

By Alana Little



Photo credit

Caption: Mo Madden presents Deputy Administrator Shana Dale with a gift of appreciation.

Sally Ride was the first American woman in space and the strides just keep on coming! “The national space program as a whole is stronger for having women in the workforce,” said Shana Dale, NASA Deputy Administrator, during her address to the attendees gathered at the National Women’s History Month event held on March 8 at Goddard’s Goett auditorium. Ms. Dale was invited to speak at the invitation of the Women’s Advisory Committee (WAC) and addressed the theme, “Women: Builders of Communities and Dreams.”

**She threw out a few statistics.... “Twenty percent of the Scientists and engineers at NASA are women and 1/3 of the entire NASA workforce is female.” She quoted NASA Director Michael Griffin as saying “When I travel around NASA I see a workforce that looks like a profile of our nation....” “NASA Administration is deeply committed to recruiting and maintaining a diverse workforce, she said.”**

“Ms. Dale, went on to rattle off the names of several outgoing/overachieving women like some would rattle off the names of the hottest movie stars. She mentioned Dr. Mary Cleve, Associate Administrator, Science Mission Directorate at NASA HQ; Lisa Rowe, Director of Langley Research

Center; Dolly Perkins, Deputy Director-Technical; Krista Paquin, Associate Director; Barbara Cherry, Associate Director for Communication; Dr. Laurie Leshin, Director of Sciences and Exploration; Nancy Abell, Chief Financial Officer; Sharon Wong, Special Assistant for Diversity; Dr. Kim Weaver, Astrophysicist and Haydee Maldonado, Formulation Manager for the Solar Probe/Solar Sentinels, mission plus many others. “These women are just a few of NASA’s leading ladies, making strides in their fields and influencing a younger generation of female employees here at NASA,” she said. The Deputy Administrator commended these women on their hard work and said “we must demonstrate to our younger employees that NASA is full of dynamic women.”

Ms. Dale also announced some of her goals for NASA which are to make sure we continue to have strong education programs in place to promote science and engineering to all children and to continue to promote and advance the ongoing goal of diversity throughout NASA. She gave special thanks to the Women’s Advisory committee (WAC) and Maureen Madden, of Code 581, coordinator of the event for their work in this area.

As a special thanks for her inspiring talk, Maureen presented Ms. Dale with a Goddard Space Flight Center coffee mug and a plaque and then escorted her to a “meet the employees luncheon.” Afterward Barbara Cherry escorted her on a tour of Goddard’s facilities. ■

## Employee Spotlight

Marc Kuchner

By Alana Little



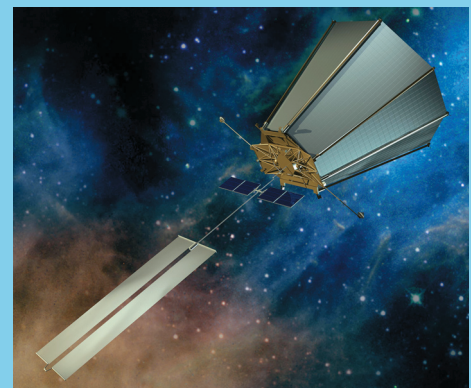
Caption: Marc Kuchner

Growing up, astrophysicist Marc Kuchner wanted to be like Carl Sagan, host of the 1980's PBS series, "Cosmos". That and his general love of solving difficult problems led him to Harvard, where he received his B.A in Physics, to Caltech where he received his Ph.D. in Astronomy and then to Harvard again and Princeton for his post-doctoral studies. Marc started his staff position at Goddard nine months ago as the first outside hire in the new Exoplanets and Stellar Astrophysics Laboratory.

Currently, Marc is studying theoretical and observational imaging projects related to directly imaging Extrasolar Planetary Systems – meaning he's looking for ways to actually see planets outside our solar system that orbit nearby stars the same way the Earth orbits the sun. Marc studies these planets using the technique of coronagraphy; this technique increases the dynamic range of a telescope so it can see planets without being overpowered by the glare from the stars they orbit. Marc and his team are specifically interested in collecting images of the light from these planets, light that will help them learn about the chemical make-up of those planets. Why is this important? It's important because it can help answer one of the most fundamental questions in science—can life exist on other planets?

Marc Kuchner came to Goddard so he could "be where the action is," he said. Planet finding is an international enterprise, and according to Marc, "Goddard is a Mecca for this type of research."

But this research isn't the only cool thing about Marc Kuchner...he's also a musician and songwriter. Marc is currently working on his first CD of original Country songs, titled *Curiosity*. Interestingly enough, he got into music while taking a break from academia. He found a job as an intern with a recording studio and fell in love with the process of making good music. He plays the guitar and spends much of his free time writing songs about love, friendship, pain and all the stuff that makes life interesting. Will he be the next Toby Keith? He doesn't think so but he hopes to sell a few songs one day and he knows that he'll be playing the guitar and writing songs for the rest of his life, whether he spends it here or on another planet. ■



Caption: Terrestrial Planet Finder