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GoddardView

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Dr. Mather Goes to Annapolis

By Dewayne Washington

Dr. John Mather was recognized on March 6, 2007 during the Maryland General Assembly on the State Senator floor and the floor of the Maryland House of Delegates for his accomplishment as co-recipient of the 2006 Nobel Prize for Physics. Dr. Mather grew up in New Jersey, but he has been a resident of Prince George's County for many years. ■

Photo credit: Pat Izzo

Caption: Current President of the Maryland State Senate (left) Thomas Mike Miller along with Maryland State Democratic Senator Paul Pinsky (right) congratulates Dr. Mather (center) on his accomplishment during a visit to Annapolis on March 6, 2007.

Photo credit: Pat Izzo

Caption: Maryland State Democratic Senator Paul Pinsky, District 22, Prince George's County introduces Dr. Mather on the floor of the State Senate.

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Cover Caption: An artist's concept of a "Hot Jupiter" extrasolar planet.

Credit: NASA/JPL-Caltech

GoddardView Info

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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. Ideas for new stories are welcome, but will be published as space allows. All submissions are subject to editing.

Deep Impact Extended Mission Could Probe Deeper Into Solar System Origin

By Bill Steigerwald

In July 2005, the *Deep Impact* spacecraft released a probe that blasted a crater in comet Tempel 1, spilling its elements into space so scientists could discover its composition. The assault was justified because comets are thought to be leftovers from the formation of our solar system, so learning more about them helps us to understand how our solar system came to be.

Since those fireworks, the spacecraft has cruised silently through space, healthy and able to take on another mission, if needed. The *Deep Impact* team realized that with the spacecraft already built and launched, extra discoveries could be made at very little cost—a bonus for an already successful mission.

The team put together a proposal to use the spacecraft's telescope to observe the atmospheres of alien worlds, and to visit another comet. The proposed extended mission is called Extrasolar Planet Observation and *Deep Impact* Extended Investigation (EPOXI), and it has received $500,000 from NASA for an initial study to determine the requirements and costs in greater detail.

If approved, as *Deep Impact* passes by Earth on December 31, 2007, it will use our planet's gravity to direct itself to comet Boethin. While it cruises toward the comet, the first part of the extended mission—the investigation of alien worlds—would begin in January 2008. More than 200 alien (extrasolar) planets have been discovered to date. Most of these are detected indirectly, by the gravitational pull they exert on their parent star. Directly observing extrasolar planets is very difficult, because the star is so brilliant compared to the planet. Planets simply get lost in the glare, like fireflies near a headlight.

Sometimes by chance, however, the orbit of an extrasolar planet is aligned so that it eclipses its star as seen from Earth. In these rare cases, light from the extrasolar world can be seen directly. "When the planet appears next to its star, your telescope captures their combined light. When the planet passes behind its star, your telescope only sees light from the star. By subtracting light from just the star from the combined light, you are left with light from the planet. We can analyze this light to discover what the atmospheres of these planets are like," said Drake Deming, Deputy Principal Investigator for EPOXI at GSFC.

Deep Impact will observe three nearby stars with "transiting extrasolar planets," so named because the planet transits, or passes in front of, its star. The planets were discovered earlier and are giant planets with massive atmospheres, like Jupiter in our solar system. They orbit their stars much closer than Earth does the Sun, so they are hot and belong to the class of extrasolar planets nicknamed "Hot Jupiters."

These giant planets may not be alone. If there are other worlds around these stars, they might also transit the star and be discovered by the spacecraft. Even if they don't transit, *Deep Impact* could find them indirectly. Their gravity will pull on the transit planets, altering their orbits and the timing of their transits. "Since *Deep Impact* will be able to stare at these stars for long periods, we can observe multiple transits and compare the timing to see if there are any hidden worlds," said Deming.

Around May of 2008, the extended mission will transition to the second phase as the spacecraft approaches comet Boethin. In mid-December 2008, *Deep Impact* will come within 700 kilometers (435 miles) of Boethin. Passing by at more than 10 kilometers per second (6.2 miles per second), *Deep Impact* will only have about a half-dozen hours to make detailed observations.

"The comet hit by *Deep Impact's* probe, Tempel 1, was unusual compared to other comets we have seen up close," said Michael A'Hearn of the University of Maryland, College Park, Principal Investigator for EPOXI. For example, it appears that several pieces may have come together to build up the comet's nucleus, the lump of ice and dust that comprises the solid part of a comet. Second, comets vent gases as they come closer to the Sun and warm up. Tempel 1 did this as well, but in an unusual way. Water vapor vents appeared all over the nucleus, as expected, but carbon dioxide only vented from certain parts.

Also, since comets are a mixture of dust and ice, scientists expected dust to be dragged out from any gas vent, but dust only came from the carbon dioxide vents. Third, there are some very smooth areas on the nucleus, as if something had flowed there. However, the comet's gravity is extremely weak, so scientists don't understand how any material could be pulled down to flow across the surface. Finally, there are circular areas with raised rims that resemble impact craters. However, craters haven't been seen on any other visited comets so far. Scientists are surprised to see them on Tempel 1 because it's hard to understand how craters would last, since the surface gets vaporized every time the comet's orbit takes it close to the Sun. "We want a close look at Boethin to see if the surprises of Tempel 1 are more common than we thought, or if Tempel 1 really is unusual," said A'Hearn.

Deep Impact does not have another probe, so Boethin will not get hit, but the close-up view will allow the spacecraft's infrared spectrometer to make a map of the comet's surface composition, while the telescope observes surface features. "It's exciting that we were able to combine two totally independent science investigations into a single project. However, both relate to understanding how solar systems form and evolve," said A'Hearn.

According to the team, comets and their asteroid kin are the leftover building blocks of planets, and might have contributed water and organic material to the ancient Earth, aiding the start of life. By observing extrasolar planets, scientists can compare them to our own and discover what we have in common, what we don't, and perhaps why.

Elements of the EPOXI mission were among approximately two dozen proposals submitted in response to NASA's *Discovery* Program 2006 Announcement of Opportunity last April. NASA selected three proposed new *Discovery*-class missions, and three "mission of opportunity" proposals that would make use of existing NASA spacecraft, for concept development funding.

Two of the three existing spacecraft proposals used the *Deep Impact* spacecraft, and were later combined into the EPOXI proposal. NASA may select one or more investigations to continue into a development effort after detailed review of the concept studies. Decisions about which mission concepts will proceed to development are expected in late 2007. If selected, the EPOXI project will be managed by NASA's Jet Propulsion Laboratory. ■

NASA "AIMS" to Clear up Mystery of Elusive Clouds at Edge of Space

By Cynthia O'Carroll

NASA is preparing to launch the Aeronomy of Ice in the Mesosphere (AIM) spacecraft, the first mission dedicated to the exploration of mysterious ice clouds that dot the edge of space in Earth's polar regions. These clouds have grown brighter and more prevalent in recent years and some scientists suggest that changes in these clouds may be the result of climate change.

The first opportunity for launch is on Wednesday, April 25 from Vandenberg Air Force Base, Calif., aboard a Pegasus launch vehicle.

AIM will conduct the first detailed probe of this unusual phenomenon typically observed approximately 50 miles above Earth's surface in the mesosphere. The mesosphere is the region just above the stratosphere. Researchers know very little about how these polar mesospheric clouds form, why they are being seen at lower latitudes than ever before, or why they have recently grown brighter and more frequent.

"These clouds are indicators of conditions in the upper reaches of Earth's atmosphere, and are an important link in the chain of processes that result in the deposition of solar energy into Earth's atmosphere," said Mary Mellott, AIM Program Scientist. "AIM will provide an understanding of how and why these clouds form—an important contribution toward the NASA goals of understanding the fundamental physical processes of our space environment—and how the habitability of planets is affected by the interaction of planetary magnetic fields and atmospheres with solar variability."

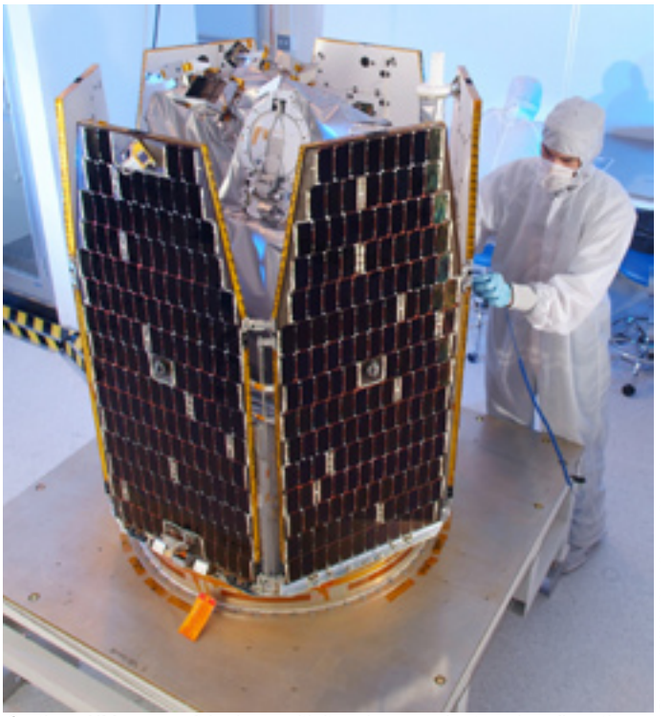

Photo credit: NASA/Orbital Sciences Corporation

Caption: AIM spacecraft is shown with its solar arrays in stowed configuration.

The clouds are noctilucent, meaning they can be seen from the ground only at night, when they are illuminated by sunlight no longer visible from Earth's surface. The brightest of these clouds are now known to be primarily composed of water ice. Their seasonal lifecycle is controlled by complex interactions between temperature, water vapor, solar activity, atmospheric chemistry, and small particles on which the cloud crystals form.

Human-induced factors such as carbon dioxide cause a warming in the lower atmosphere, but a cooling in the mesosphere.

The clouds form in the coldest part of Earth's atmosphere at the summer season in the polar regions. In the Northern Hemisphere, they begin appearing in mid-May and last through mid-August, in the Southern Hemisphere beginning mid-November and lasting through mid-March.

"The occurrence of these clouds at the edge of space and what causes them to vary is not understood," said AIM Principal Investigator (PI) James Russell III, Hampton University, Hampton, Va. "One theory is that the cloud particles grow on 'seeds' of meteoric dust or dust lofted up from below. AIM will provide the comprehensive data needed to test current theories for cloud formation or develop new ones, and allow researchers to build tools to predict how they will change in the future."

AIM will be composed of three instruments: the Solar Occultation for Ice Experiment, the Cloud Imaging and Particle Size Experiment, and the Cosmic Dust Experiment. The satellite will simultaneously measure air pressure and temperature, moisture content, and cloud dimensions, providing data needed to determine the role of polar mesospheric clouds as an important indicator of the planet's changing climate.

The clouds appear to be a relatively recent phenomenon, first reported in the late 19th century shortly after the volcanic eruption on the Indonesian island of Krakatoa. The first daytime observations of the clouds were made by satellite in 1969. Regular space-based observations began in 1982 with NASA's Solar Mesosphere Explorer using instruments primarily designed for other purposes.

"This small explorer mission is a good example of the huge science returns we can get for a relatively small cost investment," said Vicki Elsbernd, Program Executive for the AIM mission, NASA Headquarters.

For more information about NASA and the AIM mission, visit: http://www.nasa.gov/aim ■

The LRO Project is in Development

By Natalie Simms

Photo credit: NASA

Caption: This is an artist's concept of the LRO spacecraft in orbit around the Moon.

Of the two luminaries that dominate our sky, it is the Moon that is of particular interest to the Lunar Reconnaissance Orbiter (LRO) project. The LRO will travel to the Moon in late fall 2008, mapping the surface to help pave the way for humans to return. It will help prepare us for extended surface exploration on the Moon and for subsequent missions to Mars and other distant destinations. Lunar surface exploration will help us to practice living, working, and gathering science data before we venture into riskier territory.

LRO will take the first strides in researching a complex habitat—a hostile environment without atmosphere or clouds, with daytime temperatures reaching as high as 250°F (123°C) and as low as minus 450°F (233°C), and sunlight lasting two weeks. The spacecraft will identify the volatile terrain so we can land safely. It should also be able to identify water on the surface, if it sees it.

The spacecraft being built here at Goddard will include six instruments and a Mini-RF technology demonstration that includes: Cosmic Ray Telescope for the Effects of Radiation (CRaTER), Diviner Lunar Radiometer Experiment (DLRE), Lyman-Alpha Mapping Project (LAMP), Lunar Exploration Neutron Detector (LEND), Lunar Orbiter Laser Altimer (LOLA), and Lunar Reconnaisance Orbiter Camera (LROC).

The objective is to collect the highest resolution and most comprehensive data set ever returned from the Moon, or gathered by any planetary mission, to help achieve NASA's goal of returning human explorers safely to the Moon.

The data gathered by instruments on the LRO will provide more information than all six *Apollo* surface missions managed to produce. While the *Apollo* missions focused on gaining science from the band around the Moon's equator, the LRO will circle the poles. It will spend at least one year in low, polar orbit, with all the instruments working simultaneously to collect detailed information about the lunar environment. Data sets will be deposited in the publicly accessible Planetary Data System within six months of its primary mission completion.

The LRO is scheduled to launch aboard an Atlas V 401 rocket from Cape Canaveral Air Force Station in Florida in 2008. It will take approximately four days to enter the Moon's orbit. Once the probe arrives at the Moon, it will spend a year mapping the polar regions from an average altitude of approximately 31 miles (50 kilometers).

Be sure to follow this project from the ground up and beyond launch day by peering into a series of articles that will highlight its completed milestones and mission status updates. You will come to understand the main components of its development and will be enthralled by the ingenuity and diligence of the team at work in making history.

Visit the LRO Web site at http://lunar.gsfc.nasa.gov for more information on the mission. ■

Symposium Explores Past, Present, Future of Space Exploration

By Mike Calabrese

Photo credit: Chris Gunn

Caption: NASA Administrator Michael Griffin Keynotes the Symposium.

The 45th Annual Robert H. Goddard Memorial Symposium was held March 20–21, 2007 at the University of Maryland University College Inn and Conference Center. This annual symposium is sponsored by the American Astronautical Society (AAS) and supported by Goddard.

This years theme "Sputnik to Orion: Perspectives, Opportunities, and Future Directions," provided a forum to reflect and wonder about humankind's fascination with space exploration.

Goddard's Center Director Ed Weiler began the session welcoming attendees on the first day and introducing keynote speaker NASA Administrator Dr. Michael Griffin. Dr. Griffin reflected on the last 50 years of space exploration that included President John F. Kennedy's challenge, which propelled our nation into a leadership role on the space frontier. "I do believe the most significant and lasting outcome of our national reaction to *Sputnik* was the creation of NASA in 1958 as the Agency responsible for our Nation's civil space program," Griffin said.

Looking into the future, Griffin cited his recent article in the online edition of *Aviation Week* and *Space Technology* in which he concluded that, "If we continue to receive today's budget in inflation-adjusted dollars—no more and no less—we will have enough money to do an *Apollo*-scale program, three times over, and more, by the 100th anniversary of *Sputnik*."

In conclusion, Griffin spoke about program planning and insisted that "We must bring forward realistic programs, executable within the budget portfolios."

Also, these programs should not be relying on the achievement of "miracles in series." He described the "mission areas of space exploration, scientific discovery, and aeronautics research as strategic capabilities for our Nation. And further, that they can operate in balance and synergistically with each other."

A "Sputnik to Orion: 50 Years in Space," video was presented as an introduction for the first session of the symposium. The video included a few memorable images that captured some of the amazing accomplishments of the first 50 years of the space age.

The first day of the symposium also included technical sessions covering "The Space Age at 50: What Can History Tell Us?" Moderated by Roger Launius; "Engineering Space Exploration," moderated by Doug Cooke; "Engineering Space Commercialization," moderated by Doug Comstock; and "Engineering the Systems—Lessons Learned," moderated by Joe Rothenberg.

During lunch, U.S. House of Representatives Nick Lampson (D-TX) addressed attendees and reflected on the importance of keeping the public informed as to the results and importance of our space exploration, scientific discovery, and aeronautics research efforts.

Kathie Olsen, Deputy Director of the National Science Foundation (NSF) provided the keynote address on the second day. She talked about the role of NSF working together with NASA and making contributions to astronomy, space weather, and astrobiology. Technical sessions on the second day included "The Science Enabled by the Moon," moderated by Jim Garvin and "Space and Earth Science 2020," moderated by Laurie Leshin and Rick Obenschain.

Wednesday's lunch speaker was Lon Rains, Editor of *Space News*. During lunch, the President of AAS, Mark Craig presented Wesley T. Huntress, Jr., with the Randolph Lovelace II Award; Marcia Smith with the John F. Kennedy Astronautics Award; Richard Williams with the Melbourne W. Boynton Award; and Dr. James Hansen with the Eugene Emme Astronautical Literature Award.

The 2006 co-recipient of the Nobel Prize for Physics Dr. John Mather concluded the second day of presentations. He spoke about his work with the Cosmic Background Explorer (COBE), winning the Nobel Prize and provided a future glance into space science with the James Webb Space Telescope (JWST). Mather concluded that JWST will continue our pursuit of improved understanding directed at the major questions facing us in astrophysics.

Student and Goddard Research and Development Posters were presented in the lobby throughout the symposium. The presentations and videos are available on the AAS Web site at: www.astronautical.org ■

Virginia Space Flight Academy Space Camp Ready to Take Flight for Another Year of Summer Science Fun

From The Virginia Space Academy, Wallops Va.

If you know a student that is interested in how rockets and spaceships fly, aerodynamics, microgravity, flight simulation, extraterrestrial travel, and the role of radar, weather, and robotics, Space Flight Adventure Camp and the Eastern Shore of Virginia is the place for them to be, this summer!

The Virginia Space Flight Academy has begun accepting registrations for 11–15 year-old students to experience the fun and excitement of week-long residential programs. Academy camps are conducted at NASA Wallops Flight Facility on Virginia's Eastern Shore near Chincoteague Island, Va. The Academy is supported by the Eastern Shore Regional Partnership, the Virginia Commercial Space Flight Authority, NASA, NOAA, and the U.S. Navy.

At the Space Flight Academy camps, young space enthusiasts are involved in a host of exciting, hands-on and minds-on experiences. In addition to building and launching their own model rockets, young space explorers engineer and conduct a simulated rocket launch from an actual NASA mission control room while seated behind computer consoles with individual headsets. Returning to the program this year, are activities that make use of robotics kits and flight simulators.

Virginia Space Flight Academy offers students, ages 11–15, a wonderful and truly unique opportunity to enjoy a week-long, fun-filled summer camp experience, combined with educational field trips to operational NASA, NOAA, and US Navy facilities. Typical trips are visits to NASA's Vehicle Assembly Building, Range Control Center, Radar Sites, Launch Pads, Aircraft Control Tower, Fire & Rescue Station, Aircraft Hangers, the NOAA Command and Data Acquisition Station, and the U.S. Navy Aegis Training Center. During these outings, Government personnel explain the functions of the facilities and educational background required to be employed there, thus giving students insight into career development opportunities.

Robert Marshall, Executive Director stated, "I know of no other camp in the United States that has the capability to visit as many actual operational facilities!"

Because Wallops is an operational NASA facility, students can expect to see any number of aircraft, from the Marines "Hells Angles" F18s, NASA C-130, P-3 Orion, research aircraft such as the ER-2, as well as Navy and Coast Guard aircraft. Some may even witness an actual sounding rocket launch!

Another unique aspect of the program is it's small size. This past summer 8 one-week camps were conducted with enrollment limited to the first 34 paid students. The actual enrollment for the summer of 2006 was 181. Geared primarily for students from the Mid-Atlantic Region of the U.S., this past summer's camps included students from Massachusetts, Rhode Island, Wisconsin, New Jersey, Florida, Texas, New Hampshire, and Washington State!

Evenings are filled with fun-filled activities such as trips to a Chincoteague amusement park, Assateague National Wildlife Refuge, and launching model rockets.

Eight camps, for 11–15 year old co-ed students, will be held beginning June 17 through August 17, 2007. Each camp begins on Sunday afternoon and ends on Friday at 1 p.m. Tuition for each camp is $645, which includes barracks style housing, meals, transportation while at camp, a workbook, T-shirt, and all instructional materials.

For additional information and online registration for Space Academy 2007, visit the Web site at: www.VaSpaceFlightAcademy.org. ■

Caption: Space Flight Academy students on a field trip to the Wallops Island Watch Towers.
Photo Courtesy of the Virginia Space Flight Academy

Symposium's Poster Session Celebrates Stellar Students

By Amy Pruett

The Goddard Symposium commemorates NASA's current achievements and celebrates future accomplishments to come, drawing attention to the Agency's significant milestones, events, missions, and projects. A highlight of this year's symposium was the intriguing and informative student poster sessions introducing NASA's future leaders to the community. Students used the sessions to share their research and show their contributions as members of the NASA team. While each student displayed exemplary knowledge and revealed great potential, one stellar high-school senior, Anna Cyganowski, appears to be a future leader of future leaders.

Anna Cyganowski's driven, proactive nature is certain to propel her to great achievements. This is evident in how far she has taken the experience of completing her seven-week involvement in the competitive GSFC High School Internship Program (HIP), which ended August 18, 2006. The program offers internship opportunities to further inspire students in areas of scientific interest. Students traditionally receive a single assignment, but Cyganowski, in her pursuit to get as valuable an experience as possible, wanted more.

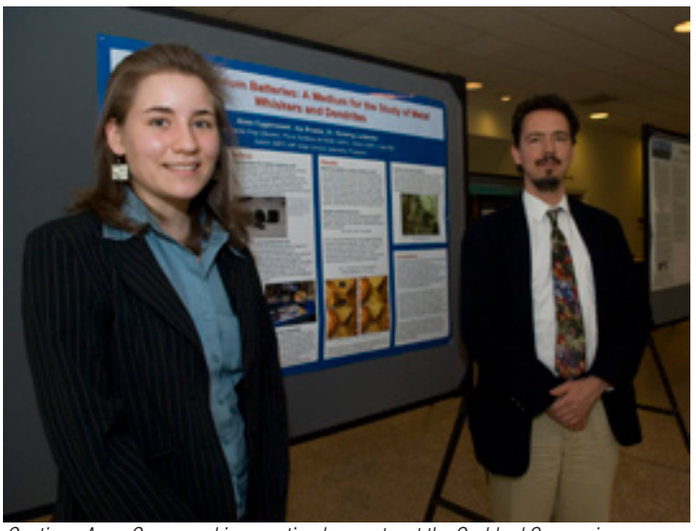

Photo credit: The Composite Crew Module Team

Caption: Anna Cyganowski presenting her poster at the Goddard Symposium.

Before her internship began, she sought out, and was given, permission to pursue a second internship assignment in her other noted area of preference, researching metal whiskers and dendrites. After coordination with HIP's manager, her mentor in the NASA Robotics Academy and the world-renowned researchers, Dr. Henning Leidecker and Jay Brusse (contractors for Perot Systems in Code 562), her ideal internship was set, she would support the academy, as well as investigate metal whiskers and dendrites.

While her experience with the NASA Robotics Academy was inspirational and beneficial, her investigation of metal whiskers and dendrites has most enabled her to share her passion for science, and engineering with her peers, local community, and professional scientists, as her Goddard mentor, Jay Brusse, attests.

"Though Anna's internship with us has ended, she is still carrying it forward into March/April of 2007 as she continues to spread her experience and knowledge," said Brusse. "In particular, she has encouraged and stimulated interest in technology in her peers at her high school."

"Anna has a thirst for learning," commented Brusse. "A lot of what she did, she did on her own time…." In my 16 years working at NASA, I can honestly say that I have not met any other high school or college student (even rarely a professional) who has shown the combination of innate technical abilities, curiosity, and enthusiasm for science and engineering as I have observed in Anna," said Brusse.

For the 2007 Goddard Symposium Poster Session, Cyganowski was one of two high school students to present.

"My project deals with what are known as metal whiskers and metal dendrites," said Cyganowski. "Metal whiskers are just what they sound like, tiny filaments of metal such as tin, zinc, and cadmium. Sometimes, metal whiskers will grow on circuit boards, which are found in anything electronic, and create electrical shorts, which are problematic. Metal whiskers have caused failures in satellites, pacemakers, and nuclear reactions, among others. Nobody knows exactly how or why metal whiskers form."

"Metal dendrites, on the other hand, are much like metal whiskers in that they can create electrical shorts, too," continued Cyganowski. "But, they look like ferns, and we know exactly how and why they form."

"In my project, I examined a nickel cadmium battery cell to see if any kind of metal formation was causing failures in the cell. . . . I thought that cadmium whiskers might be the culprit, which would have been neat to see, since nobody has studied metal whiskers in that way before. But, along the way, I found that metal dendrites are a more likely cause of nickel cadmium battery failures."

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Symposium's Poster Session Celebrates Stellar Students

Continued from Page 8

As part of her research, Anna documented her findings through photographs and videos, which Code 562 often uses to explain the difference between metal whiskers and metal dendrites.

"Within days of completing her internship, I was already promoting the fruits of Anna's research project to other educators who had asked me for stimulating ideas for their own science labs," said Brusse. "She has produced a road map, which others can follow and further explore."

Judges of the Intel Science Search 2007 agree on the significance and benefit of Cyganowski's research. Among 1,705 entrants to the competition, which considers itself "America's oldest and most prestigious high school science competition," and the "Junior Nobel Prize," Cyganowski was named 1 of 300 semifinalists for her project titled "Nickel Cadmium Batteries: A Medium for the Study of Metal Whiskers and Dendrites." She worked with her mentors following the end of her internship to write a professional paper on her project and piece together all of its elements for the competition. The achievement earned her an award of $1,000, and $1,000 to her high school, Notre Dame Prep School in Towson, Md., to fund further development of future exemplary students.

Recognition from Intel for her research has brought Anna Cyganowski additional acknowledgments from her county of residence as well as Goddard. Baltimore County Executive, Jim Smith declared February 5, 2007, "Anna Cyganowski Day" and she is the 2007 recipient of the coveted Olin Teague Memorial Scholarship through the Space Club Scholars program.

In addition to pursuing her science interests, Cyganowski has been busy changing the environment for others at school. In her sophomore year at Notre Dame Prep School, she founded an all-girls Botball team, a hands-on learning experience in robotics for high school students.

The program has grown from 7 participants to 20 and they will compete at the 2007 D.C. Regional at the University of Maryland and then attend the Botball National Conference on Educational Robotics in Hawaii.

Anna is also president of her school's Student Technology Advisors (STArs) club, which offers daily technical support to fellow students. At Notre Dame Prep, each student receives a laptop upon admission to the school and STArs hosts a week-long "laptop camp" for incoming freshman to orient them to their laptops and the school's network.

While Anna Cyganowski is busy with her numerous daily activities, she maintains a focus on her academics and future career.

"My internship experience has helped me realize how important my academics are right now. Sure, I've always known that I should study hard in school, but last summer I discovered how much more there is for me to learn. NASA Goddard is an exciting place and I just need to make sure that I'm prepared enough so that I can make an adequate contribution in the future."

It appears Anna Cyganowski need not worry. Her accomplishments have already made a contribution to NASA science and to the Agency's future. Her inspired efforts along with those of the other participants at this year's Godddard symposium are the types of accomplishments that can propel a Nation to explore the Moon, Mars, and beyond.

For additional information on Anna Cyganowski's research, visit: http://nepp.nasa.gov/WHISKER/dendrite/index.html

For additional information on GSFC internship programs for high school students, visit: http://education.gsfc.nasa.gov/

For additional information on the 2007 Goddard Symposium, visit: http://www.astronautical.org/ ■

Did You **Know**?

Inorganic Coating:

NASA developed a coating to protect metal structures from Sun, salt, and water. The coating is nontoxic and nonflammable, bonds quickly to steel and lasts for more than 25 years. ■

Goddard Commends the Participants of the Goddard Symposium Poster Session

By Amy Pruett

During the 45th Robert H. Goddard Memorial Symposium held in Adelphi, Md., March 20–21, the NASA community and the American Astronautical Society celebrated NASA's excellence in science, technology, engineering, and mathematics. In addition, the symposium highlighted NASA's future challenges, endeavors, and anticipated triumphs. A key component of the symposium, as it looked to the future of the Agency, was the addition of a student poster session for Goddard's student interns. The students, who will be the future of NASA, shared the results of their exemplary research and further proved their role in NASA's success.

Anjanette Hawk: Southwestern Indian Polytechnic Institute (SIPI)
Use of Remote Sensing Technology for Land Use/Land Cover Studies on the Navajo Reservation

David Edell: Queen's College, City University of New York (CUNY)
APL Command and Telemetry Database

Kamara Brown: George Washington University
An Assessment of the System Engineering Conceptual Design Laboratory

Charles Malespin and Robert Moore: University of Louisiana at Lafayette
Electric Currents in Granite and Gabbro Generated by Impacts up to 1 km/sec

Jonathan Goodsell and Jon Brame: Brigham Young University
Issues Relative to Developing of Carbon Nanotube-Based Nanocompasses for High Spatial Resolution Magnetometry at GSFC & BYU Measuring Strain-Based Changes in the Resistance of Carbon Nanotubes

James Brown and Kevin Milstead: Catholic University of America
Micro-Scale Thermal Control

Oscar Barton and Joseph Navarre: U.S. Naval Academy
Gear Bearing Epicyclic Gear Trains

Christopher Stark: University of Maryland, College Park
Resonant Debris Disk Structure Created by Terrestrial-Mass Planets

Rachel Dudik: George Mason University
Low Ionization Nuclear Emission-Line Regions: The Missing Link in the Galaxy Population

Anna Cyganowski: Notre Dame Preparatory School
Nickel Cadmium Batteries: A Medium for the Study of Metal Whiskers and Dendrites

Peter Phelps: University of Maryland, College Park
Agent Based Intelligence in a Tetrahedral Rover

Tiffany Russell: University of Maryland, College Park
James Webb Space Telescope: XML Telemetry and Command Exchange
Enceladus Astrobiology and Geophysics Lander Mission (EAGLE)

Charles Sosa: Rye High School
Validation of Regional Model Validation Over West Africa Using the TRMM Satellite

Ilana Lefkovitz: Stella K. Abraham High School
Aerosols: Remote Sensing

Ari-David Brown: NASA Postdoctoral Fellowship Program
Tunable Antireflection Lavers for Planar Bolometer Arrays

Terry Hurfurd: NASA Postdoctoral Fellowship Program
The Role of Tidal Stress in Controlling Geyser-Like Eruptions Enceladus

Joseph Gland, Tanya Klinkhachorn, Kevin Luu, and Matthew Faulkner: University of Maryland, College Park
Decentralized Motion Control for Multiple Mobile Robots

Jonece M. Layne: Glenarden Woods Elementary School
SISTER

Nikkia Anderson: Drexel University
Archiving of Web Information at GSFC

Julie V. Stern: State University of New York at Stony Brook
3D Modeling of High Energy and Radio Emission from Rotation-Powered Pulsars

The student participants of the Goddard Symposium's Poster Session are congratulated for their valuable contribution to NASA science and for their diligent, thorough research. ■

Goddard Scientist Joins Mission to Mercury

By Bill Steigerwald

Dr. Mehdi Benna, an Assistant Research Scientist in Goddard's Atmospheric Experiment Branch, joins the science team on NASA's mission to Mercury. Benna was selected for the Mercury Surface, Space Environment, Geochemistry and Ranging (MESSENGER) mission Participating Scientist Program with a 6-year, $630,000 grant.

"It's a great opportunity for a young scientist who is still building his career," said Benna. "MESSENGER will be the first spacecraft to orbit the planet Mercury." Benna is affiliated with the University of Maryland Baltimore County. He comes to Goddard with the Goddard Earth Sciences and Technology Center, a collaboration between Goddard and the University of Maryland Baltimore County (UMBC).

Benna won the grant with a proposal to make computer models of the space environment MESSENGER will encounter around Mercury. The models will calculate the interaction of the solar wind, a stream of electrically charged gas blown constantly from the Sun, with Mercury's magnetic field. "These models will help predict the basic environment MESSENGER may see," said Benna. "They will make data collection more efficient by helping us understand its context—the environment seen by the spacecraft when it takes data on Mercury." Benna's proposal was titled: "Advanced Magnetohydrodynamic Modeling of the Magnetosphere of Mercury to Support the MESSENGER Mission."

A model will be due before each of the Mercury flybys, set for January 2008, October 2008, and September 2009, and before MESSENGER enters Mercury orbit in March 2011. The spacecraft will take data on Mercury's space environment during each of these events, which Benna will incorporate into the next model. This way, the model is continually refined. He will also constantly update the model during the orbital mission. "It will be similar to the way meteorologists increase the accuracy of their computer forecasts of weather on Earth by plugging in data from weather stations and satellites," said Benna.

The effort is officially scheduled to begin this April. It is funded through the Research Opportunities in Space Science program at NASA Headquarters. Goddard also has Co-Investigators on the MESSENGER mission: Drs. Mario Acuna, James Slavin, David Smith, and Jacob Trombka.

For more about MESSENGER, please visit:
http://messenger.jhuapl.edu/index.php ■

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Solicitations:

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Released: 2007-01-22
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Proposal Due: 2007-02-01

NASA Earth and Space Science Fellowship/07
Released: 2006-11-01
Proposal Due: See Announcement

Strategic Education Alliance (SEA)
Released: 2007-03-09
Proposal Due: See Announcement ■

Employee Spotlight: Catherine Fairchild
Flying High and Inspiring the Next Generation

By Alana Little

Photo credit: supplied by Cate Fairchild

Caption: Cate with the beloved NASA 8 plane.

C.T. (Cate) Fairchild is a pilot first and foremost. Sure, she works at Goddard as a Project Support Specialist in the Aircraft Office (Code 830) at Wallops Island, Va,. Sure, she spends her days handling all the financial support for the aircraft office, including all budget phasing and Program Operation Plans (POP), but the highlight of her career is when she gets to fly Goddard's plane known as NASA 8, which, according to Fairchild, makes all the paper pushing worthwhile.

You didn't know that Goddard has its own aircraft? It sure does. Currently, Goddard has three planes, a Beechcraft Model 200 Super King Air (NASA 8); a Lockheed P-3B Orion (NASA 426); and a Douglas DC-8-72 (NASA 436). While NASA 8 has various uses, it is predominately used for personnel transport.

Cate will be flying 26 years in October. She's always been a huge aviation enthusiast and working at Goddard, flying NASA 8 has been "a dream come true...", she said. Her dad, (a former Goddard contractor), began flying as a teenager. He inspired her to get a pilot's certificate when she was 19-years old.

While this accomplished pilot is experienced, she still believes she has more to learn and is studying to get her Air Transport Pilot certificate after 75 more flight hours (the certificate requires 1500 flight hours total). This is the same license that Southwest and USAir pilots need to fly those enormous Boeing 747s. She is also enrolled in the Part-Time Graduate Study Program, working on her Master of Aeronautical Science (MAS) at Embry-Riddle Aeronautical University.

Working as a pilot has always been a dream of Fairchild's and she has worked hard to get where she is, but like most successful people, none of it would be possible without the help of a few mentors. Her first mentors were her mom and dad, Arlene and Ken Thom, but Fairchild also mentions George Postell (her supervisor) and Rich Rogers in the Aircraft Office as being great unofficial mentors. Jay Pittman, her official NASA mentor, has been extremely supportive as well.

When asked about the challenges she has faced as a female pilot, Cate talks about the field being male-dominated and getting a little push-back once in a while until people realize she knows her stuff. She is most surprised that there are very few people of color in aviation. In fact, she let me know that the University of Maryland Eastern Shore (UMES), a historically black intuition, has an aviation science program whose mission is to "educate future professional technical specialists, managers, and professional pilots for the field of aviation, both in the private and public sectors." "I would encourage everyone to follow their dreams, whatever they may be," she says.

In addition to her demanding job, Cate is giving a little back to the community by being active with the Experimental Aircraft Association (EAA) Young Eagles, a program launched in 1992 to give interested young people, ages 8–17 an opportunity to go flying in a general aviation airplane. These flights are offered free of charge and are made possible through the generosity of EAA member volunteers. She is also involved in the Aircraft Owners and Pilot's Association's (AOPA) Project Pilot, a mentoring program that provides a student pilot with the wisdom and support of an experienced pilot. Their belief is that "a student with a Project Pilot Mentor is three times more likely to successfully complete their training." Cate wants young people to know that flying a plane is possible and she says you can get a plane for under $30,000, making flying something that is economically achievable. Cate has owned three planes and she currently flies a Piper Cherokee 235.

Knowing that only 6 1/2% of pilots are female, Cate thinks women and girls should be especially encouraged to go up in a plane to "dispel some of the mystery about flying." "The neat thing about aviation is that kids can be inspired to learn about math, geography, and science. There are all sorts of applications," she said.

Cate's plate is so full, you wouldn't think there was more she was thinking of doing, but she has plans to participate in the EAA AirVenture Oshkosh (formerly Oshkosh Airshow), an annual gathering of aviation enthusiasts held each summer at Wittman Regional Airport in Oshkosh, Wis. "It's a great trip, a long seven-hour flight in a small plane, but we [she, her husband, and her son, a freshman at University of Maryland College Park] have made the trip the past two years. It's a lot of fun."

I asked Cate how one woman can do all of this and she responded, "My faith has played a big part in my life. I always believe in trusting myself, but I also believe in a higher power."

At the end of our fascinating conversation, Cate made me promise to plug NASA 8 and to mention that it is available for GSFC use. "It's a great resource and for institutionally funded programs, it's free," she said.

To learn more about NASA 8 please vsit:
http://wacop.wff.nasa.gov/OtherNASA8Desc.cfm ■