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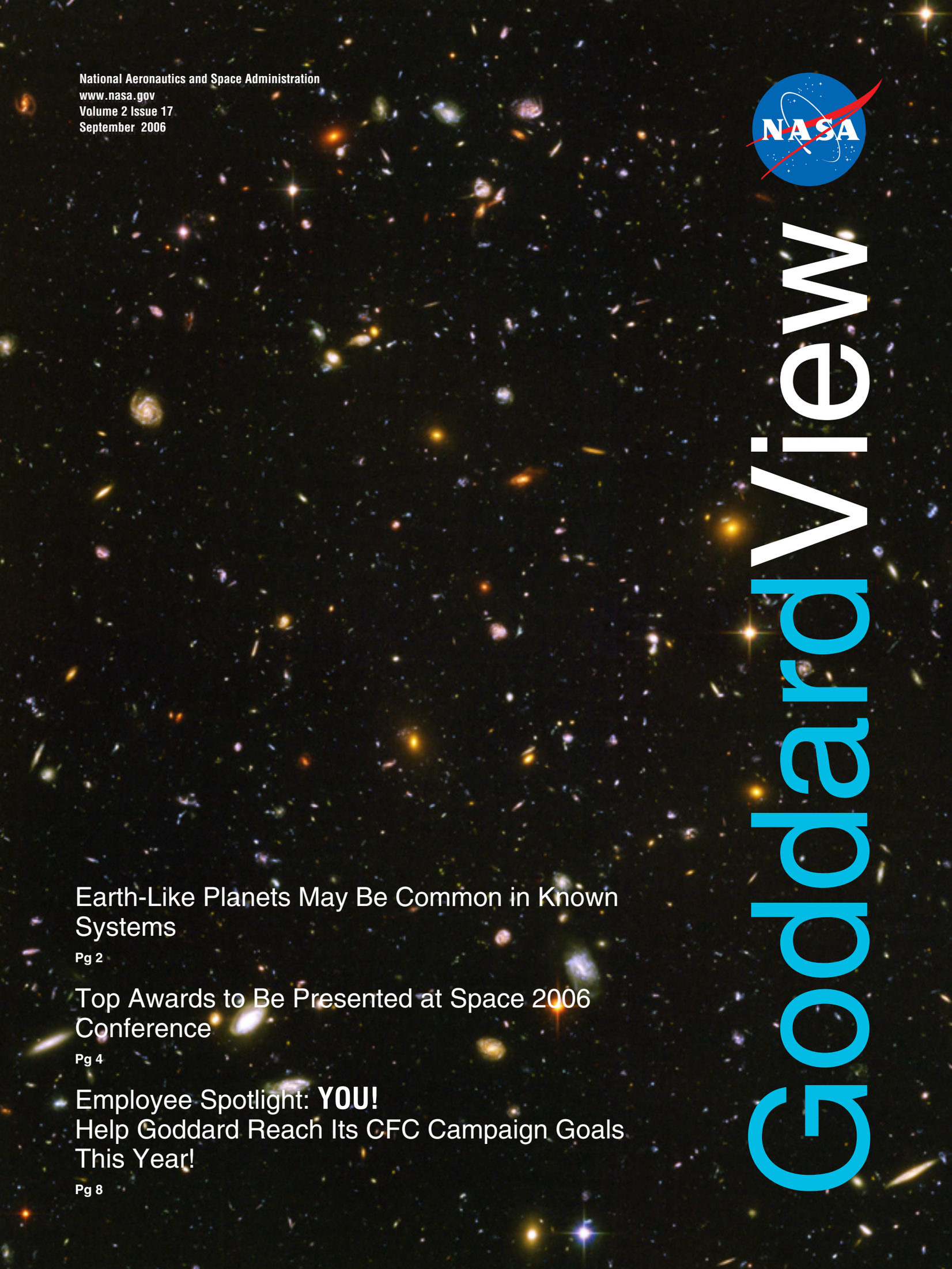

Earth-Like Planets May Be Common in Known Systems

By Nancy Neal-Jones and Cynthia O'Carroll

More than one-third of the giant planet systems recently detected outside our solar system may harbor Earth-like planets covered in deep global oceans, which offer abundant potential for life, according to a new study by scientists associated with NASA's Astrobiology Institute.

The study focuses on planetary systems that contain "Hot Jupiters"—gas giant planets that orbit extremely close to their parent stars—even closer than Mercury to our own Sun. Hot Jupiters are believed to have migrated inward toward their parent stars just as the planetary systems were forming, disrupting the space environment and triggering the formation of ocean-covered, Earth-like planets in a "habitable zone" conducive to the evolution of life, according to the new study.

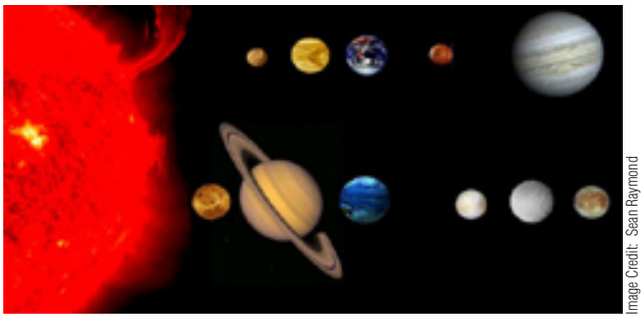

Image Credit: Sean Raymond

Caption: This image shows the differences (not to scale) between the inner regions of our solar system, and a simulated planetary system containing a "hot Jupiter." The solar system has four terrestrial planets: Mercury, Venus, Earth, and Mars. Earth is in the habitable zone, where water can exist on its surface. The other planetary system contains a "hot Earth," a few times larger than Earth but very close to the star, an ocean-covered planet in the habitable zone, and several icy planets in the outer system.

Previous studies have indicated that as Hot Jupiters plowed through protoplanetary material on their inward migrations toward their parent stars, all the surrounding material would be vacuumed up or ejected from the system. "The new models indicate these early ideas were probably wrong," said co-author Sean Raymond of the University of Colorado, Boulder.

Published in the September 8 issue of *Science*, the study indicates Hot Jupiters push and pull protoplanetary disk material during their journeys, flinging rocky debris outward where it is likely to coalesce into Earth-like planets. At the same time, turbulent forces from the surrounding dense gas slow the small, icy bodies in the outer reaches of the disk, causing them to spiral inward and deliver water to the fledgling planets. These planets may eventually host oceans several miles deep, according to the study.

The research team ran exhaustive simulations lasting more than eight months each on more than a dozen desktop computers, starting from a disk of more than a thousand rocky and icy protoplanets about the size of the Moon.

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Cover Caption: Galaxies, galaxies everywhere—as far as NASA's Hubble Space Telescope can see. This view of nearly 10,000 galaxies is the deepest visible-light image of the cosmos. Called the Hubble Ultra Deep Field, this galaxy-studded view represents a "deep" core sample of the universe, cutting across billions of light-years.

Image Credit NASA, ESA, S. Beckwith (STScI) and the HUDF Team

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 Wednesdays 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.

The Universe Looks Like a Woman Without a Facelift: An Afternoon with Emily Levine

By Trusilla Steele and Alana Little

Feminist, humorist, speaker, radio commentator, Harvard grad, and science aficionado Emily Levin believes that how we construct the Universe is similar to how we construct our social structure. According to her Web site, she "combines two outstanding talents: 1) she connects big ideas with our everyday lives—the Milky Way with the Beltway, the larger universe with the smaller universes of home, workplace, and market; and 2) she makes it funny."

She became interested in science in the early 90s when she read an article about dark matter in the Los Angeles Times. She described scientist's conception of the Universe as a "designer showroom" where there's this vast space with "little clumps of matter artfully arranged within the void."

It is with this wry way of looking at science that Emily Levine entertained the crowd gathered in the Building 8 auditorium on August 23, 2006 in honor of Woman's Equality Day. The event, sponsored by the Woman's Advisory Committee (WAC), is an annual commemoration of the 1920 passage of the 19th amendment to the Constitution granting women the right to vote.

With Letterman-like hilarity, Levine referred to quirky newspaper clippings and used her own wry sense of humor to illustrate and emphasize her beliefs that "in order for true equality to exist among the sexes, we need to have a Universe that looks like us [women]." Levine claims that not only does she know what the Universe should look like, but she also knows the steps to get us there.

Step One involves us going to a Technicolor universe by removing the either/or logic, or Newton's logic, known as dualism. Because dualism means "there can only be two of anything," this logic creates division and eliminates having a broad spectrum. Levine further explained that "dualism works great as a tool like it did during the gas crisis in the 70s when selling gas was based on the odd or even numbers of license plates."

Levine explained how "either/or" logic could be more conducive if it was replaced with a dash (either-or), therefore, representing continuity; a spectrum that creates an equal playing ground for both sides. She also said that "when choices are reduced to two, it encourages one side to conquer the other. One side must be good or bad; one side must win or lose, which further creates the logic of contradiction; denying the alternative, which further creates rationality."

In order to create a balance and remove the inequalities generated from the "either/or" logic, Levine suggest adapting "both-and" logic. This logic is based on quantum physics logic that says light is "both" a wave and particle "thus the logic of 'both-and' was born. This logic implies that of two things, both can be true, which trains you to be balanced."

Levine likes to call this "and-and" logic because in quantum physics there are multiple possibilities and "both-and" still limits those possibilities to two. So Levine's logic would be "you can have your cake and eat it too and lose weight." This mirrors a universe where there's good and bad and ideas that are right and wrong." The and-and logic is a paradox; allowing two apparent contradictory alternatives to co-exist.

Levine's second step to creating a Universe that looks more like women deals with objectivity. She stated that Newton's objectivity divides us into subjects and objects with the objects being on top. The subjects subjugate the objects. Levine goes to English grammar to explain this theory. She explains that the subject is the mover and shaker of the sentence, and it directs the verb (the action) to act upon the object. This type of logic also sentences women to passivity because in ancient Greek taxonomy where the masculine and feminine were first defined, the female was noted to be the passive object and the masculine voice was active. The active voice does the speaking while the passive voice doesn't speak at all. "She" has to be spoken for.

Levine then points out that in hospital nurseries across the country above baby boys the signs typically read "I'm a Boy!" While above girls, the signs read "It's a Girl!" So you have a situation where historically men got to define themselves and assign themselves all the positive attributes giving all the lesser attributes to women (ex. men are rational and women are irrational).

The third step involves reduction. Newton's theory of reduction divides everything into what matters making what doesn't matter "dark matter." She says, that upon examining Gödel's theory of incompleteness; "there's no formal system of logic that can determine everything that can be either true or untrue." This was mind blowing because the physicist's only job was to decide what was true and what was not. Before recovering from that blow, along came quantum physics and the Copenhagen Interpretation, which consisted of two theories from different angles basically saying "we can not know everything." In quantum physics, the proof was the more you know about one thing the less you know about another. In terms of the bigger picture, Levine concludes that "nobody's in control; we are not masters of anything...no one is at the wheel." Levine goes on to say that "mastery must always coincide with mystery and rhyme with reason."

While Levine's unusual way of studying science and humorous way of looking at life may leave your head spinning at times, the truth is if we can fashion a Universe based on her steps we would all be better off!

For more information on Emily Levine visit:
http://www.emilylevineuniverse.com/ ■

Top Awards To Be Presented at Space 2006 Conference

By Carol Stewart

The American Institute of Aeronautics and Astronautics (AIAA) presented four awards for key contributions to space science and technology during the Space 2006 Conference and Exposition held September 19–21 at the San Jose McEnery Convention Center in San Jose, California. Lockheed Martin, NASA Ames Research Center, and the U.S. Air Force's Space and Missile Systems Center co-chaired the conference, which was organized by AIAA.

The following was presented at the Space 2006 Conference Award Luncheon on Tuesday, September 20, 2006.

Elbert Rutan, President and CEO of Scaled Composites in Mojave, California, was recognized with the AIAA George M. Low Space Transportation Award. The award was presented for a timely outstanding contribution to the field of space transportation. Rutan is recognized for development and successful flight demonstration of the first civilian spaceship; for sparking global interest in space tourism; and for enabling commercial passenger suborbital spaceflight.

Byron Wood, President of Pratt & Whitney Rocketdyne, Inc. in Canoga Park, California, was recognized with the AIAA von Braun Award for Excellence in Space Program Management. The award is presented for outstanding contributions in the management of a significant space or space-related program or project. Wood is recognized for successfully managing the largest liquid propulsion rocket engine company and for installing and innovating a novel management organization system, which reduced development costs and schedules.

Stephan Price, Division Scientist in the Space Vehicles Directorate of the Air Force Research Laboratory at Hanscom AFB, Massachusetts, was recognized with the AIAA Space Science Award. The award is presented to an individual for demonstrated leadership of innovative scientific investigations associated with space science missions. Dr. Price is recognized for pioneering achievements in infrared astronomy and space-based experiments with state-of-the-art infrared cryogenic sensors. The maps and catalogs he produced are fundamental references in infrared astronomy and the Department of Defense.

NASA's Earth Observing System (EOS) Team will be recognized with the AIAA Space Systems Award. The award is presented to recognize outstanding achievements in the architecture, analysis, design, and implementation of space systems.

All members of the EOS Team over the past 14 years are being collectively recognized for developing the Earth Observing System (EOS). EOS consists of a series of Earth-observing satellites and an advanced data system, as well as teams of scientists that represent the first global environmental monitoring system. Dr. Michael King, Senior Project Scientist, accepted the award.

Each honoree received an engraved medal, a certificate of citation, and a rosette pin.

Lockheed Martin was the corporate sponsor for Space 2006. NASA Ames Research Center and the U.S. Air Force Space & Missile Systems Center were the co-chairs. Other sponsors and supporters included: The Aerospace Corporation, Gordon Biersch Brewing Company and Brewery Restaurants, Stellar Solutions, Inc., United Space Alliance, California Space Authority, and the American Astronautical Society. *Space News* is the official conference media sponsor.

AIAA's premier annual space conference, Space 2006, serves as a venue for senior government and industry leaders and technologists. Under the theme, "The Value Proposition for Space: Security, Prosperity, Discovery," the conference explored the importance of space access and exploration for civil, commercial, security, and scientific purposes, as well as the associated science, technology, logistics, and, economics. Panel discussions and technical sessions addressed topics such as "The New Race for Commercial Value in Space," "Emerging Entrepreneurs and Their Business Cases," "Space Partnering Initiatives," and "Technologies to Enable Global Security." Approximately 1,000 representatives from Government, industry, and academia attended the three-day event, and more than 50 organizations and companies were to attend the exhibit. More information is available at www.aiaa.org/events/space. ■

Smithsonian Solar Experiments Benefit from Unique Goddard Facility

By Nancy Pekar

When researchers at the Smithsonian Astro-physical Observatory (SAO) needed a state-of-the-art coating on the optics used in their solar-laboratory experiments, they turned to the space-optics leader: NASA Goddard Space Flight Center.

The unique coating provided by Goddard's thin-film coating facility allows SAO's mirror to reflect light over a wide range of wavelengths. Having this improved optic dramatically increases the efficiency of SAO's experiments, allowing researchers at SAO and at institutions throughout the world to rapidly acquire the atomic data needed to develop more accurate models of the solar atmosphere. This work was performed under a new type of Space Act Agreement (SAA)—that is, a Simplified SAA.

Benefits of Technology Transfer

- Goddard's optical coating is about twice as efficient as a commercial coating, allowing SAO's researchers to obtain data about four times faster.
- As a not-for-profit organization, SAO was not in a financial position to develop its own coating capabilities. Being able to access Goddard's facilities saved significant time and money.
- Performing this type of "work-for-hire" allows Goddard to maintain its state-of-the-art facility.
- By working closely with SAO as a partner, Goddard ensures that future optics needs of NASA and SAO are met.
- The first-ever Simplified SAA provides a template that allows for rapid review and approval of routine, low-cost, small-scope projects such as this.

"Goddard is the only place in the country that does this kind of coating. We could have tried to make do with a commercial coating, but they're significantly less efficient. If we weren't able to access Goddard's facilities, it would have taken us four times as long to get the data we need. It has a big impact on our ability to do the experiments," said Dr. Larry D. Gardner, a Physicist with the Smithsonian Astrophysical Observatory.

Scott Owens, Optics Branch Technology Coordinator from Goddard agrees, saying that "the Simplified Space Act Agreement represents a new, faster process for routine work of a limited scope. This template agreement can be routed through our legal and financial systems in a matter of weeks."

About Smithsonian Astrophysical Observatory

Located in Cambridge, Massachusetts, SAO is a research facility of the Smithsonian Institution, as well as a member of the Harvard-Smithsonian Center for Astrophysics (CfA). Founded in 1890, SAO includes a broad program of research into astronomy, astrophysics, and Earth and space sciences by more than 300 scientists.

Technology Origins

Researchers in Goddard's thin-film coating facility developed an innovative coating that reflects a wide range of wavelengths of light, allowing for unprecedented imaging. The process begins with an aluminum (Al) coating that is protected by a top layer of magnesium fluoride (MgF_2). This protective coating provides excellent reflectance for wavelengths down to about 120 nm. In fact, optics with this coating have been used on dozens of NASA space flight missions, including the Hubble Space Telescope. At wavelengths below 120 nm, the MgF_2 layer on top becomes opaque.

Goddard's researchers realized that boron carbide (B_4C), which is relatively transparent above 120 nm, can reflect light in the 50–150 nm range. Covering the protected aluminum coating with a thin layer of B_4C allows the mirror to reflect light efficiently from the red wavelengths down to the extreme ultraviolet (EUV) range.

Finding a New Use

Optics with reflectance over a wide wavelength range are essential for SAO researchers studying solar processes. Specifically, these researchers conduct laboratory experiments to study and measure cross-sections for electron impact excitation in multiple-charged ions. This process is the source for all light from the Sun; however, most cross-sections for producing light in the EUV range are known only from theoretical calculations. Experimental data are needed to validate the theoretical methods, understand the processes, and explain the distributions in the intensities and wavelengths of the Sun's light.

Such experiments require mirrors that can reflect and focus light over a wide range of wavelengths. Goddard's Al/MgF_2 coating process, combined with its ability to provide the B_4C coating in the same laboratory, would provide SAO with the mirrors it needed. A partnership for collaboration was the next logical step.

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Did You Know?

Flexible Eyeglass Frames:

Memory metals such as titanium alloys are used to make flexible metal eyeglass frames. The metals come from research for the International Space Station. ■

NASA Solicitation and Proposal Integrated Review and Evaluation System (NSPIRES)

Supporting research in science and technology is an important part of NASA's overall mission. NASA solicits this research through the release of various research announcements in a wide range of science and technology disciplines. NASA uses a peer-review process to evaluate and select research proposals submitted in response to these research announcements. Researchers can help NASA achieve national research objectives by submitting research proposals and conducting awarded research. This site facilitates the search for NASA research opportunities.

For more information, please visit https://nspires.nasaprs.com

Solicitations:

NASA Keck Time Solicitation – Call for Proposals
Released: 2006-08-18
Proposal Due: See Announcement

Observing at the NASA Infrared Telescope Facility – Call for Proposals
Released: 2006-02-03
Proposal Due: See Announcement

NASA ARMD Research Opportunities in Aeronautics (ROA) NRA
Released: 2006-05-24
Proposal Due: 2007-08-24

Observing at the NASA Infrared Telescope Facility – Call for Proposals
Released: 2006-02-03
Proposal Due: 2006-10-02

Research Opportunities in Space and Earth Sciences – ROSES 2006
Released: 2006-01-23
Proposal Due: See Announcement

Smithsonian Solar Experiments Benefit from Goddard Facility

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The Transfer Process

Having learned about Goddard's thin-film coating capabilities via articles in scientific journals, SAO researchers contacted their counterparts in Goddard's Optics Branch. The Office of Technology Transfer at Goddard developed the Simplified SAA, which was signed on February 6, 2006. SAO provided the optics and reimbursed Goddard for the thin-film coating services.

Looking Ahead

After testing at several wavelengths—from 70 nm to above 120 nm—in SAO's laboratories, the optics will be incorporated into the electron impact excitation experiment for measurements on twice-ionized carbon at 97.7 nm.

If you would like additional information about Goddard's technology transfer opportunities, visit: http://techtransfer.gsfc.nasa.gov

Earth-Like Planets May Be Common in Known Systems

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The initial conditions for each computer model were based on current theories of how planets formed in our own solar system and simulated about 200 million years of planetary evolution.

The team concluded that approximately one out of three of the known planetary systems could have formed as-yet-undetected Earth-like planets in so-called habitable zones similar to the one in which Earth's orbit resides. "The fraction of known systems that could have the potential for life may be significantly higher than we had thought," said co-author Mandel Avi of The Pennsylvania State University, University Park, Pa., and NASA's Goddard Space Flight Center, Greenbelt, Md.

The new collaborative research effort may allow planet hunters to determine rough limits for where to search for habitable planets in known systems of giant planets. "We hope other researchers may be able to use our new model to narrow the list of potential targets in the search for other Earths," said co-author Steinn Sigurdsson, also from The Pennsylvania State University.

Goddard Technologies Give UB Students Hands-On Assessment Experience with "Lab to Market" Program

By Nicole Quennell

Starting in Fall 2006, liberal arts, law, and MBA students at the University of Baltimore will have the opportunity to work directly with NASA Goddard Space Flight Center researchers and technologies through the school's Lab to Market program. As part of the program, students will assess Goddard technologies and collaborate with University faculty and Goddard researchers to develop commercialization plans and potential licensing opportunities.

Benefits of Technology Transfer

- The agreement will enhance NASA's strategic technology objectives, providing Goddard with assessment information about potential applications and licensing opportunities for possible technology transfer efforts.
- NASA researchers will collaborate with future academic, law, and business leaders who may be well positioned to work on future technology licensing efforts.
- University of Baltimore students will gain hands-on experience with assessments and market-development plans.
- University of Baltimore will benefit from the recognition and prestige NASA's participation in its program may yield.
- Eventual users of Goddard's technologies will benefit from new uses assessed through collaboration between University students and Goddard researchers.

"NASA Goddard can benefit tremendously from the assessments the university students will conduct for our technologies. Using their insights, we'll be able to better understand additional applications and licensing opportunities,"said Monica Montague from the Office of Technology Transfer (OTT), at Goddard.

The Center for Technology Commercialization (CTC) at the University of Baltimore's Merrick School of Business is part of the school's Entrepreneurial Opportunities Center, facilitating the commercialization of technologies from Federal labs using a cross-disciplinary team approach. The CTC has worked with about 40 Federal research and development (R&D) labs, several incubators (including the NASA-affiliated Emerging Technology Centers in Baltimore), and numerous inventors. The Lab to Market program will be added to this list of collaborative efforts that teach hundreds of students to apply their knowledge and skills to real technologies.

The Transfer Process

The Space Act Agreement (SAA) between Goddard and the University of Baltimore was a natural extension of their 12-year history of collaboration. The University of Baltimore contacted the OTT regarding use of NASA technologies for its Lab to Market Program. The OTT arranged the agreement enabling use of Goddard technologies and collaboration with Goddard researchers.

Looking Ahead

University of Baltimore students began working with NASA technologies as part of the Lab to Market program in the fall semester of 2006. A three-year agreement, the SAA enables students and faculty to choose a set of Goddard technologies to work with each semester. Teams of at least four students will analyze an assigned technology using intellectual property (IP) audits, brainstorming, security analyses, economic feasibility, development of return-on-investment, and other collaboration with researchers. Final reports from the teams will be made available to Goddard and will include arguments for their analyses, technology/market assessments, identification of IP issues, competition, market analyses, potential applications, and other valuable data.

If you would like additional information about Goddard's technology transfer opportunities, please visit: http://techtransfer.gsfc.nasa.gov ■

Employee Spotlight: **YOU!**
Help Goddard Reach Its CFC Campaign Goals This Year!

By Natalie Simms

Every year many employees at Goddard and around the world contribute to the largest and most successful workplace giving campaign, the Combined Federal Campaign (CFC). The CFC has its roots in many charities and has opened the door to more opportunities for generous giving to literally hundreds of worthy causes. Donating is a voluntary commitment that works to make a difference for people and organizations that truly need assistance. With this year's theme, "Be a Star in Someone's Life! Support the CFC," Goddard has aspired to reach the goal of $525K. Be a shining star in someone's life by participating in this year's campaign from October 1–November 25!

Upcoming CFC Events

Goddard will be hosting various CFC events throughout the duration of the campaign. Be sure to demonstrate your willing spirit by participating in these activities.

CFC Kickoff—10/2, Noon, Bldg. 8 Auditorium

This is a celebration to start the ball rolling! Associate Director Krista Paquin provided opening remarks. Loan Executive Debra Hood of CFC of the National Capital Area will welcome and introduce the campaign. The Red Cross and various other charities, as well as team captains will be in attendance. Lunch will be served. Come show your support!

How to Pledge

After the CFC Kickoff event, each civilian employee will be provided campaign materials from your keyworker (the designated individual responsible for helping your office through the CFC process), which will include a charity catalog and a pledge card. A searchable charity catalog can also be accessed online at http://www.cfcnca.org/giving/catalog.

Show your support by pledging to the CFC via payroll deduction, cash, personal check, or confidential gift. Electronically pledge by setting up a payroll deduction (civil servants only) via WebTADS, the electronic time and attendance system. However, note that this feature of WebTADS will not be accessible the first week of the campaign because of the year-end closeout of Goddard's financial system. Pledges via WebTADS will start the second week of the campaign.

You Make the Difference

Whether you are a veteran pledger, a new employee, or have never given to the CFC, it is you who makes the difference. By making a contribution or serving as a volunteer, you bring light to someone's life, which is in harmony with this year's theme. By your selfless actions and/or contributions to the charity of your choice, you will undoubtedly experience the satisfaction that comes from giving to others. Every day you are a star when you help others help themselves. ■