National Aeronautics and Space Administration

Goddard View

Volume 8 Issue 6
August 2012

Goddard's Innovation Lab: Creating a Future

Pg 4

The Heroes Behind HEROES

Pg 6

Goddard Celebrates Curiosity's Landing

Pg 10

www.nasa.gov

Goddard View

THE WEEKLY

Sun Emits a Medium-Intensity Solar Flare
On July 28, the sun emitted a mid-level flare, categorized as an M6.2 flare coming from an active region named AR 1532. This image was captured by Solar Dynamics Observatory in the 131 Angstrom wavelength, which is typically colorized in teal and which is a particularly good wavelength for observing flares. Click the image for the whole story.

New Sounding Rocket Website Created
A new website for the sounding rocket program was launched this week. The page include s status of upcoming launches, and mission highlights and results, and photo and video. Click the photo to visit the new site.

Are You Ready to Retire?
The NASA Shared Services Center (NSSC) offers many resources to simplify the retirement process. To obtain current information, visit Retirement Application Processing, where you will find service descriptions and references in how to apply for retirement. Click the NSSC logo to begin your retirement journey by accessing the Retirement Application or Estimate Request Web page.

Scott Braun and NASA's Hurricane Campaign
Scott Braun is the Hurricane Severe Storm Sentinel (HS3) mission principal investigator at Goddard. Braun leads a diverse team using NASA's two Global Hawk unmanned aircraft to understand the conditions that favor storm formation and often lead to the development of major hurricanes. The campaign is set to start September from Wallops. Click on the photo of Braun to learn more about him and HS3.

CONTENTS

Goddard Updates
The Weekly - 2
New Video Brings a Golden Touch Behind the Webb - 3
Goddard's Innovation Lab: Creating a Future - 4
The Heroes behind HEROES - 6
Geothermal System Installed in Building 25 - 8
Goddard Exhibits Future Communication Design at Intrepid Museum - 9

Goddard Community
Goddard Celebrates Curiosity's Landing- 10

Outside Goddard
Severine Tournois - 12

Cover caption: Visitors at the Goddard Visitor Center cheer along with JPL as Curiosity successfully lands on Mars.

Photo Credit: NASA/Goddard/Bill Hrybyk

GoddardView Info

Goddard View is an official publication of NASA's Goddard Space Flight Center. *Goddard View* showcases people and achievements in the Goddard community that support Goddard's mission to explore, discover, and understand our dynamic universe. *Goddard View* is published weekly by the Office of Communications.

Managing Editor: Trusilla Steele
Editor: John M. Putman
Graphic Designer: Mike Marosy

News items for publication in *Goddard View* must be received by noon Wednesday of each week. You may submit contributions to the editor via e-mail at john.m.putman@nasa.gov. Ideas for new stories are welcome but will be published as space allows. All submissions are subject to editing.

NEW VIDEO BRINGS A GOLDEN TOUCH BEHIND THE WEBB

By: Rob Gutro

NASA technology does some amazing things. Imagine taking one-tenth of an ounce of gold and spreading it so thin that it completely coats something over four feet in diameter. That's what scientists and engineers did for the primary mirror segments that will fly on NASA's James Webb Space Telescope.

The Webb Telescope has 18 hexagonal-shaped mirror segments that make up its primary mirror. Each of the segments is 1.32 meters (4.3 feet) in diameter, flat to flat. Webb Telescope scientists and engineers determined that a primary mirror 6.5 meters (21 feet 4 inches) across is what was needed to measure the light from faint astronomical sources.

To enable the mirrors to most efficiently reflect the infrared light from say, distant galaxies, a microscopically-thin gold coating was needed. Because the Webb Telescope is looking at infrared light, gold was the ideal choice because it reflects infrared light so efficiently, especially compared to the reflectivity of bare beryllium. The amazing thing is that Quantum Coating, Inc.'s mirror coating technology allowed just a tiny amount of gold to cover an entire mirror.

"The thickness of the gold coating on the mirrors is only 100 nanometers thick, or a tenth of a micron, which is 1/10,000th of a millimeter," said Paul Geithner, Deputy Project Manager–Technical for the Webb Telescope at Goddard. "A human hair is roughly 1,000 times thicker."

A new video investigates the technology that layers a micro-thin gold coating on the Webb mirrors.

The video, called "Golden Touch," is part of an ongoing video series about the Webb Telescope called "Behind the Webb." It was produced at the Space Telescope Science Institute (STScI) in Baltimore, Md. and takes viewers behind the scenes with scientists and engineers who are creating the Webb Telescope's components.

During the three minute and 48 second video, STScI host Mary Estacion interviewed people involved in coating the mirrors at Quantum Coating, Inc. in Moorestown, New Jersey.

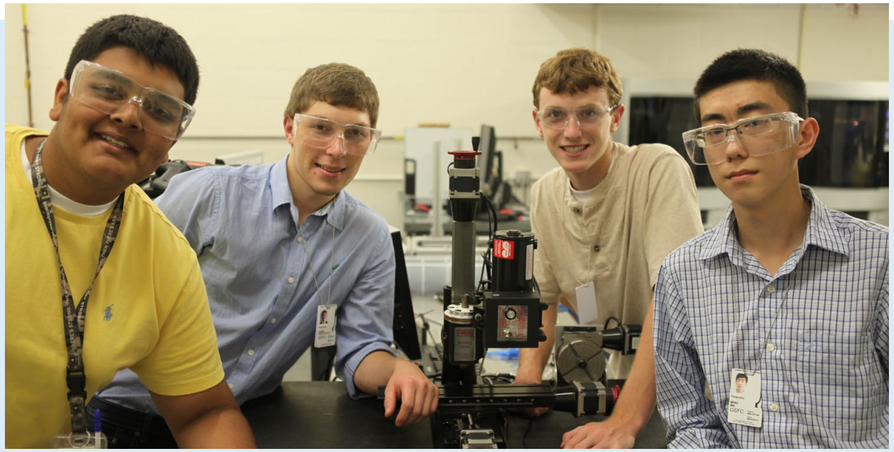
Estacion interviews Ian Stevenson, Director of Coating Services at Quantum Coating, Inc., who explained how incredibly small the coating is on the mirror.

In the video, Tyrone Wilson, a coating chamber technician who operated the coating chamber, explained that the mirrors were coated in special manner called "vacuum deposition." The mirrors are placed in a special chamber where air is removed, and the miniscule amount of gold is vaporized into a cloud. The cloud condenses on the surface of the mirror to form a film. That way, the mirrors obtain maximum reflection.

The "Behind the Webb" video series is available in Quicktime®, Windows Media, and Xvid formats. ■

Above: NASA engineer Ernie Wright looks on as the first six flight-ready James Webb Space Telescope's primary mirror segments are prepped to begin final cryogenic testing at Marshall Space Flight Center in Huntsville, Ala. Photo credit: NASA/Marshall/David Higginbotham

"The interns are learning more than just the engineering behind the designs..."



GODDARD'S INNOVATION LAB: CREATING A FUTURE

By: Aimee Lynch

Interns at Goddard are an extraordinary group. Their eyes brighten at the mention of an informative lecture, they eagerly ask questions as you pass by in the hallways, and they talk about their projects with enthusiasm. Could these high school and college students be the secret to infusing our workforce with renewed passion?

Matthew Showalter, associate branch head in Goddard's Advanced Manufacturing Branch (AMB), believes so. For several years, he has utilized the unique talent and fresh thinking of interns from around the country to collaborate on a project he calls the "Innovation Lab." When complete, the Innovation Lab will support Goddard research and development at low or no cost, while simultaneously recruiting the next generation of engineers and scientists for the center's workforce.

The Innovation Lab is currently being developed by six interns. Paul Kubitschek, an undergraduate from the University of Nebraska at Lincoln, and Kris Kincheloe, a recent graduate of the University of Oklahoma, Norman, Okla., assist Showalter in mentoring a team of four high school interns who are engineering the equipment that will populate the lab. The goal is to have a safe, enclosed work area filled with rapid prototyping machines like 3-D printers, micro mills, lathes, laser cutting and marking systems, and other advanced technologies. These machines will manufacture the parts needed to successfully test models created with computer-aided design software.

One project on which the team of interns is currently collaborating is the construction of a granite base table, which provides a precise, flat plane for mounting a computer-controlled Sherline® micro mill. The mill will hopefully be used in working with materials reinforced with microscopic carbon nanotubes, one of the frontiers in materials science, and needs to have the precision to be able to produce components with micro geometry. Future work on the design will include engineering a sealed enclosure with a vacuum and filtering system to capture excess materials, produced during the milling operation, for safe disposal.

It is central to the branch's goal that interns are able to completely run the Innovation Lab with guidance and mentoring from AMB personnel. Showalter hopes that by bringing in particularly promising young interns, he will have a hand in pipelining permanent talent into the center through the Mechanical Systems Division. This happens as students are exposed to networking opportunities, current projects and the valuable experience of accomplishing real work in the machine shop.

"Although the hardware is important, it is really the people who are the most vital aspect of a project," Showalter says. "We could have the best hardware in the world, but if we do not have the people with the experience to work on that hardware, it minimizes the return on the investment we have in the hardware." Using high school and undergraduate students to work in the lab provides valuable experience in design, manufacturing, fabrication and assembly.

Ming Ma, a high school intern attending the University of Maryland, Baltimore County in the fall, expressed his hope that this opportunity will eventually translate into a full-time position at Goddard. The practical work experience of the Innovation Lab will also aid intern Parth Aghera in his plans to pursue mechanical engineering.

The interns are learning more than just the engineering behind the designs; they are learning how to function in a professional workforce. Kirby Carmack, a senior at Poolesville (Md.) High School says he has learned about how to present ideas to management. "If you have a time slot for a presentation or a design you would like to pitch, you need to be prepared and ready to go," he says. "You have to know every little detail about your design. It's your job to defend it."

Daniel Diazdelcastillo, a freshman at Drexel University, Philadelphia, Pa., majoring in material science and engineering, agrees. He says that by working in the lab, he learned that "speaking up to the manager or mentor about possible solutions and other alternatives is important. Presenting is the key in any situation to prove a certain design is the best design for the specific task."

Whether getting experience in the practical engineering behind rapid-prototyping machines or learning about more subtle points such as working on a team, the interns are finding out what it is like to work in Goddard's diverse community. The interns in the Innovation Lab are only six out of about 500 students working at Goddard this summer.

So, the next time you walk by an intern in the halls of your office building, take a second look. In a few years they could be your officemate. ■

Above (L to R): Parth Aghera, Daniel Diazcastillo, Kirby Carmack, and Ming Ma around the Sherline mill for which they are building a customized, granite-base table. Image provided by Paul Kubitschek

Opposite: Goddard intern Kirby Carmack works on one of the 3-D printers in the Innovation Lab. Photo credit: NASA/Goddard/Jacob Larsen

THE HEROES BEHIND HEROES

By: Janet Anderson and Susan Hendrix

Call Jessica Gaskin and Steve Christe "heroes" and they'll laugh. But these enterprising NASA researchers—the former at the Marshall Space Flight Center, the latter at Goddard—are leading a heroic undertaking. They're co-principal investigators on a new project to prepare, modify, test and launch a sophisticated, balloon-borne X-ray telescope designed to expand knowledge in two fields of extraplanetary science. Few members of the team have participated in a flight mission and they've got just 12 months to get airborne.

Cue the *Mission: Impossible* theme? Not a chance. NASA has so much faith in the team's High Energy Replicated Optics to Explore the Sun (HEROES) project, that it recently was selected for the agency's prestigious Hands-On Project Experience (HOPE) training award.

First presented in 2009, the honor is designed to promote achievement and accelerate career advancement among scientists and engineers with no previous flight project experience, as they take a mission from concept to launch to post-flight analysis over the course of a year. Eligibility extends to any NASA civil service researchers developing in-house payloads that can be flown aboard available, low-cost NASA and commercial vehicles.

"The engineering data and scientific findings from these projects inform a variety of other NASA activities," said John Grunsfeld, associate administrator for NASA's Science Mission Directorate. "But the most valuable aspect of the HOPE awards is as an accelerated learning opportunity for promising NASA team members enhancing their technical, project and leadership skills to continue our mission well into the 21st century."

One of only two projects selected for the 2012 HOPE award, HEROES is a joint effort between Marshall and Goddard science teams to fly a powerful X-ray telescope on a two-day mission in Earth's stratosphere, some 25 miles up. It's slated to launch in the fall of 2013, from the Fort Sumner, N.M., test site managed by the Columbia Scientific Balloon Facility of Palestine, Texas.

Despite its flight inexperience and the project's tight timeline, the HEROES team benefits from standing on very strong shoulders. The Marshall and Goddard centers have more than 35 years of experience in flying high-altitude test balloons, plus decades more in scientific research and vehicle development, integration, testing and launch. The HOPE award provides direct access to that experience. As part of the award, the 17-member HEROES team will be mentored throughout the project by seasoned science, engineering and flight projects personnel on a nearly one-to-one basis.

HEROES' name is a bit deceptive; it doesn't quite cover the breadth of the project's goals. During the day, the balloon-lofted payload will indeed explore the sun, studying powerful solar flares to give NASA solar scientists new insight into the way our star's magnetic energy functions.

At night, the telescope's eye will turn outward to other stars and celestial phenomena such as the Crab Nebula targets of keen interest to NASA astrophysicists studying the origins of the cosmos and the lifecycle of stars and galaxies like our own.

Developed at Goddard, this sophisticated pointing technology will enable scientists to aim HEROES with a high degree of precision, targeting specific points on the sun to obtain high-resolution images and spectroscopic data. The goal is to hone in on low-energy X-rays signifying the start of particle acceleration in the solar corona—the trigger for the process that culminates in the massive outbursts of energy we see as solar flares.

> "...we hope to demonstrate how NASA can... improve the return on its investment"

"We're asking a very basic question here: How does energy get released in the solar corona?" Christe says. "It's our goal to add to our understanding of how the sun works, so we're going where the action is."

Gaskin and Christe are proud of the dual purpose of their project, which unites NASA's heliophysics and astrophysics divisions—separate sciences often pursuing similar goals.

"We see a lot of the same processes everywhere we look in space, from the sun to the farthest points in the known universe," Christe says. "The sun is the perfect laboratory to study so many of the processes we see in action around the cosmos. At the same time, studying the birth, life and death of stars millions of light-years away helps us better understand the lifecycle and behavior of our own turbulent star."

Gaskin concurs. "By successfully integrating our science goals and working together to develop and fly the instrument that will achieve them, we hope to demonstrate how NASA can cut costs, combine resources and dramatically improve the return on its investment across all the sciences," she says.

"It's exciting to put together a project with such a relatively small price tag and such big ambitions," Gaskin says. "It's an opportunity to deliver big science on a budget." ■

Above (L to R): A balloon-borne gondola bearing NASA's HERO science mission safely lands in a Kansas field in 2005. The new HEROES flight project builds on that successful mission.

Goddard Center researcher Steve Christe, HEROES' co-principal investigator, is leading work on the project's innovative targeting technology, the Solar Aspect System.

Marshall Center researcher Jessica Gaskin is co-principal investigator for NASA's HEROES project.
Photo credit: NASA/MSFC

GEOTHERMAL SYSTEM INSTALLED IN BUILDING 25

By: Chip Wellington

Goddard has started up a new geothermal system for Building 25's Network Testing and Training Facility. The new system has been turned on and will provide heating and cooling with a geothermal HVAC (heating, ventilation, and air conditioning) system.

The newly installed system began initial operations on May 30, 2012 and will provide the building with up to 2.6 million BTUH of heating. The speed of the movement of heat is called the heat loss and is measured in BTUH, which means BTUs (British Thermal Units) per hour. The system will also supply 280 tons (3.4 million BTUH) of cooling; approximately enough heating and cooling for 90 homes (based on 3 tons of cooling per home).

This renewable energy solution was installed to avoid the replacement costs of aging steam and chilled water lines and demonstrates the feasibility to retrofit a medium sized building with this technology with minimal disruption to the building occupants.

The newly installed geothermal system contains 100 wells drilled to a depth of 400 feet per well. The ground water is re-circulated in a closed loop system through the well field and into the building's newly installed water to water heat transfer pump. The water to water heat transfer pump has eight modules capable of meeting both heating and cooling requirements automatically by assigning individual modules in either heating or cooling mode. The geothermal system installation cost was the same cost as the replacement of steam, condensate and chilled water lines that required replacement.

The cost avoidance is projected to be $34,138 annually, which is a 15 percent reduction from the current annual energy costs for Building 25. Additionally, the Central Plant will experience improved efficiency because it will no longer have to supply heating and cooling to Building 25, which was the furthest point from the plant.

The project started in May 2011 and is scheduled for completion in September 2012. The project is managed by Goddard's Facilities Division. ■

Above: System piping and pumps for routing ground water, chilled water, and hot water to provide heating and cooling for the HVAC system. Photo credit: NASA/Goddard/Debora McCallum

GODDARD EXHIBITS FUTURE COMMUNICATION DESIGN AT INTREPID MUSEUM

By: Amber Hinkle and Dewayne Washington

As New York City embraced SpaceFest, a four-day celebration of space shuttle history and the arrival of Enterprise at the Intrepid Sea, Air and Space Museum, Goddard put on display the future in space communications with a the Laser Communications Relay Demonstration (LCRD) Project.

Over 30,000 people took part in four-days of discovery, learning and fun. SpaceFest gave visitors an opportunity to explore over three dozen exhibits, displays, and educational demonstrations honoring aeronautics and space exploration past, present and future. Visitors to the museum complex explored current missions in earth and space science, NASA's future exploration endeavors and advanced technologies, and the NASA research improving and enhancing aeronautics.

The Goddard contingency was comprised of representatives from LCRD, the Hubble Space Telescope (HST), the James Webb Space Telescope (JWST), and the Solar Dynamics Observatory (SDO). Attendees were provided detailed information about several upcoming Goddard missions and events while participating in interactive demonstrations. They also had the opportunity to see a 3-D representation of how NASA will be demonstrating laser communication relay services in the near future. The HST booth allowed them to touch and operate engineering tools that were developed to support Hubble's Servicing Mission Four.

Attendees who participated in the JWST activities were able to learn how JWST will differ from Hubble, working primarily in the infrared range of the electromagnetic spectrum. At the SDO booth, attendees used Solar Equipped Telescopes to check out our sun.

"SpaceFest was an excellent opportunity for Goddard to explain and exhibit our exciting missions, interact with the public and invite the New York area community to celebrate the arrival of Space Shuttle Enterprise. We hope attendees walked away feeling energized about what NASA is doing in the future beyond the Space Shuttle," said Mike Weiss, Project Manager for LCRD. ■

Top: The LCRD Education and Public Outreach team (L to R), Deputy Associate Director for the Exploration and Space Communications Projects Division, Jeff Volosin; Amber Hinkle; and Sydney Cain, supported LCRD's presence at SpaceFest 2012.

Middle: Volosin discusses the new optical communications technologies that will be demonstrated in the coming years: the Lunar Laser Communications Demonstration (LLCD) and LCRD.

Above: Artist concept of LCRD.

GODDARD CELEBRATES CURIOSITY'S LANDING

By: Becky Strauss

At 1:32 a.m. EDT on August 6, the control room at NASA's Jet Propulsion Lab (JPL) in Pasadena, Calif., erupted in cheers at the announcement that the *Curiosity* rover had touched down safely on the surface of Mars. After two seconds of stunned silence, the late-night landing event at Goddard's Visitor Center was flooded with shouts, applause and more than a few teary eyes.

Following in the tire tracks of *Sojourner*, *Spirit* and *Opportunity*, *Curiosity* is the fourth rover to rest its wheels in Martian soil. This makes the Mars Science Laboratory (MSL) the seventh successful Mars landing in human history. *Curiosity*'s daredevil landing relied on multiple new technologies, including the largest supersonic parachute ever constructed, dozens of rocket thrusters and a sky crane that lowered the rover 25 feet to the surface.

The entry, descent and landing phase of *Curiosity*'s mission began when the MSL spacecraft reached the Martian atmosphere, about 78 miles (125 km) above the planet's surface, and switched from manual control to powered flight. In the next seven minutes, the craft had to execute a series of highly complex automated maneuvers with precise timing and no room for error, popularized by the JPL video "Seven Minutes of Terror."

The approximately 300 event attendees at Goddard' Visitor Center, including employees, local officials and members of the public, packed into the Visitor Center's main auditorium to watch the landing stream, with overflow in a tent behind the building.

As engineers and scientists on the ground waited 14 nail-biting minutes for *Curiosity*'s signal to return to Earth, attendees were glued to the monitors, every eye on the blue-shirted MSL team. When JPL announced *Curiosity*'s touchdown, the commotion at Goddard was deafening. The first thumbnail-sized images appeared to the sound of exuberant applause as attendees logged on to share the news.

While the MSL team exchanged hugs in the control room, Goddard event attendees began to trickle back into the main hall of the Visitor Center, where the evening's activities continued. Attendees took photos with a full-sized replica of one of *Curiosity*'s wheels, asked a scientist questions about construction materials on the rover and Mars rock analogues, and used 3-D glasses to view images of the Martian surface from previous NASA missions. The star of the evening was the rover landing game on Xbox Kinect®, where players took their own shot at landing *Curiosity* safely on the Martian surface. A few dozen attendees stayed to watch the JPL press conference at 2:15 a.m. EDT. The triumphant MSL team entered the room to the sound of wild applause and the flash of cameras.

Curiosity won't roll out immediately. First, engineers must conduct a series of tests to make sure the rover is on solid ground. Automated computer sequences will survey the surrounding environment and check that all systems are operational, from communications to image acquisition to scientific instrumentation. Mission controllers have also begun to deploy Curiosity's multiple cameras, sending back its first color image on the morning of August 7. Sometime soon, the team will put the pedal to the metal. ■

Photo credit: NASA/Goddard/Bill Hrybyk

OUTSIDE GODDARD

Graceful Stomping

By: Elizabeth M. Jarrell

Not too many French women come to America and discover Indian Classical dance. That is, however, exactly what optical engineer Severine Tournois did. “I was never exposed to the Indian culture growing up in the Loire Valley, France, so I don’t know where this is coming from,” says Tournois.

In 1999, while a student at University of California at Davis, she visited Berkeley and saw Indian dancing for the first time. “I fell in love with Indian dance. I was fascinated by the moves, the music, and the costumes. The moves are complex mathematical patterns but at the same time they are very graceful. My dream was to learn this type of dance,” explains Tournois. After moving to Greenbelt in 2000, she happened to drive by the Shiva Vishnu Temple and someone there recommended a local teacher from the Jayamagala Dance School.

There are five main styles of classical Indian dance, each of which is associated with the five elements of water, air, earth, sky, and fire. Tournois is learning Bharata Natyam, which is the fire dance from Southern India. “But,” admits Tournois, “I do not see how this dancing looks like fire.” She dances to live musicians with singing in Sanskrit, which the teacher translates for her. Tournois finds this dancing very rich in history and mythology. “This type of dance combines pure dance with dramatic expression. It is like poetry and mythology put into music. We use our faces and bodies to express the emotions of the words,” says Tournois.

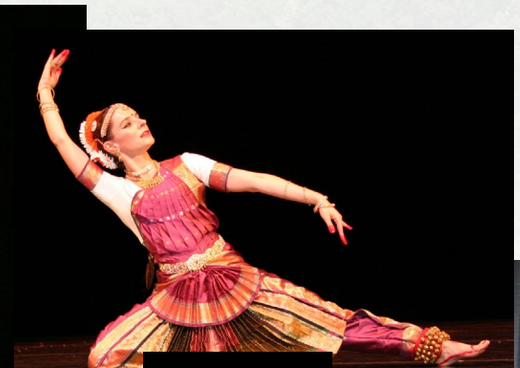
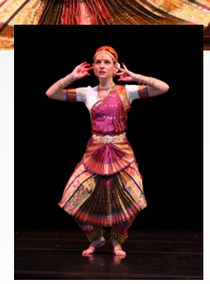
This type of dancing consists of a series of poses one flowing into the next. The poses are inspired from sculptures of the ancient temples and share common roots with yoga. “Every second of the dance is choreographed to a precise pose, from toes to fingertips to facial expressions. There is no part of the body left without a particular pose,” says Tournois. The head movements include striking neck and eye movements. Even the precise position of each finger has a special meaning. “There are over fifty different finger positions called ‘hastas’,” says Tournois. At times she uses her hands to indicate animals, as, for example, making “S” curves while slowly sinking down to the floor to mimic a snake.

Tournois had her costume custom made in India. It consists of four pieces cut from a single silk sari. She wears arm bracelets and other traditional jewelry as well as a headdress with symbols of the moon and the sun. She weaves jasmine flowers in her hair. Her makeup includes think black eyeliner and red body paint for her fingertips and toes.

She dances barefoot, which is very important. “We stomp our feet very hard in complex patterns to mimic the drumbeats with our feet. Our ankle bells emphasize this rhythm,” Tournois explains. Before each class and performance, the dancers say a prayer blessing thanking the earth for allowing them to dance and stomp on her.

She goes to class once a week and practices at home about three nights a week. Progress is slow, requiring much patience. “It can take the entire class to learn the movements for one line, which may be only one minute of the song,” notes Tournois. Most dances last from about five minutes to one hour.

After two years of study, Tournois first performed in 2002. She is unique in that she is the only non-Indian in the entire dance school, which gives one to two performances a year. She has performed in various Indian temples and schools as well as in The Cherry Blossom Festival and at the John F. Kennedy Center for the Performing Arts in Washington, D.C.

Bharata Natyam is the only kind of dance she likes or ever wanted to learn. “When I’m dancing Bharata Natyam, I feel very natural and spiritual. After ten years, I still love it as much as I did on the first day. I want to continue Indian dance for as long as I do not mind hearing my teacher ask me to stomp harder.” ■

Below: Tournois performing the classical Indian dance of Bharata Natyam. Photo provided by Severine Tournois.