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MARSHALL STAR

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Alabama Governor Designates May 3 NASA Day in Alabama; Marshall Acting Director Goldman Addresses Joint Legislative Session

By Sanda Martel

Marshall Space Flight Center Acting Director Gene Goldman, in an address to a joint session of the Alabama Legislature on May 3, said, "Marshall is still making history and making an impact on Alabama and our world. We continue to be a powerful engine for exploration, discovery, science, technology, education and economic vitality."

Image right: From left, NASA astronaut T.J. Creamer; Gene Goldman, acting Marshall Center director; and Alabama Lt. Gov. Kay Ivey. (NASA/MSFC/Emmett Given)

Alabama Gov. Robert Bentley signed into law a proclamation designating May 3 as "NASA Day in Alabama." The proclamation commends the Marshall Center for its role in space exploration, as an engine of economic development and the anchor of the aerospace industry in North Alabama.

Marshall -- the NASA center that developed the Saturn V moon rocket in the 1960s -- is now leading the design and development of NASA's new rocket -- the Space Launch System -- a heavy-lift launch vehicle that will take us beyond Earth's orbit, Goldman told the legislators.

Image left: From left, Gene Goldman, acting Marshall Center director; Alabama State Rep. Howard Sanderford, representing Alabama's 20th District, including Madison County; and Alabama State Rep. Mac McCutcheon, representing Alabama's 25th District, including Madison and Limestone counties. (NASA/MSFC/Emmett Given)

"Marshall is still making an impact on Alabama and the world," Goldman said.

"With your support, Marshall Space Flight Center pledges to keep making history every day, exploring space, learning more about our planet, inspiring the youth who will take our place, improving the quality of life for all and making Alabama proud," Goldman said during his State House address.

Image right: Gene Goldman, Marshall Center acting director, holds a press conference following his address to a joint session of the Alabama Legislature May 3. (NASA/MSFC/Emmett Given)

Marshall has a $2.9 billion economic impact on the state's economy, according to a 2009 study. Almost 6,000 government and contractor personnel work in unique and specialized facilities and laboratories at the center. In 2011, the center did about $817 million in business with Alabama companies -- 22 percent of them small businesses. Marshall is the third largest employer in Huntsville.

Marshall is not just about rocket development, Goldman said in his remarks. Marshall scientists used satellite data to track the path of destruction from last year's devastating tornado outbreak. Marshall also helped track and study the 2010 Gulf of Mexico oil spill.

Image left: From left, Gene Goldman, acting Marshall Center director; Alabama State Sen. Bill Holtzclaw representing Alabama's 2nd District, including Madison and Limestone counties; and Alabama Deputy Finance Director Clinton Carter. (NASA/MSFC/Emmett Given)

As part of the May 3 celebration of Marshall's role in the state, NASA exhibits dotted the hallways of the State House and a space shuttle main engine was displayed in front of the building. Astronaut T.J. Creamer, who lived and worked aboard the International Space Station for six months in 2009-2010 and now is a payload operations director at Marshall, also was part of the NASA contingent visiting the State House.

Creamer, in remarks to a group of state legislators and others, said that the same quest for exploration that pushed America to the moon in the 1960s is alive and well. "At the moment we are trying to go farther. We're trying to go to the moon, Mars and beyond and get to places where we have not been before because we want to learn so much more," he said.

Image right: From left are Gene Goldman, acting Marshall Center director; Alabama Gov. Robert Bentley; NASA astronaut T.J. Creamer; and Alabama State Sen. Clay Scofield, who represents Alabama's 9th District, including Madison, Blount and Marshall counties. (NASA/MSFC/Emmett Given)

Since its establishment in 1960, the Marshall Center has contributed to the nation's goals in space exploration, science, technology and economic competiveness. Alabamians working at Marshall helped put the first American in space, built the Saturn V moon rocket, the lunar rover, the space shuttle and the International Space Station.

Martel, an AI Signal Research Inc. employee, supports the Office of Strategic Analysis & Communications.

Image left: Alabama Gov. Robert Bentley is presented an Alabama state flag that was flown aboard space shuttle Discovery in February 2011 by Acting Marshall Center Director Gene Goldman during NASA Day in Alabama on May 3. (NASA/MSFC/Emmett Given)

Image right: Visitors examine various NASA display items in the exhibits area at the State House in Montgomery on May 3. (NASA/MSFC/Emmett Given)

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Final RS-25 Engine Arrives at Stennis

RS-25 series rocket engine No. 2059 is unloaded and positioned at the Stennis Space Center on April 10 for future testing and use on NASA's new Space Launch System. Managed by the Marshall Space Flight Center, the SLS is a new heavy-lift launch vehicle that will expand human presence beyond low-Earth orbit and enable new missions of exploration across the solar system. The launch system will include a core stage powered by four RS-25 engines. The No. 2059 engine was the last of 15 RS-25 flight engines to make the 700-mile journey from the Kennedy Space Center to Stennis, where they will be stored until testing begins. Engines arrive in protective crating and wrapping; some have been uncrated and hoisted into an upright position for warehouse storage while others will remain in crating until needed for the SLS Program. Built by Pratt & Whitney Rocketdyne of Canoga Park, Calif., the RS-25 engines also powered NASA's Space Shuttle Program with 100 percent mission success. (NASA/SSC)

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SHE Happens! Marshall Celebrates Safety, Health and Environmental Day

More than 2,000 Marshall Space Flight Center team members celebrated Safety, Health and Environmental, or SHE, Day with a host of activities May 2 at Buildings 4315 and 4316. Digging in for the annual tree planting are, from left, Marshall Associate Director Robin Henderson; Marshall Office of Center Operations Director Steve Doering; Marshall Center Acting Director Gene Goldman; Marshall Safety & Mission Assurance Director Steve Cash; and Ed Kiessling, manager of Marshall's Environmental Engineering and Occupational Health Office. This tree, as well as free tree seedlings for Marshall team members, were provided by the Wyle Corp. of Huntsville. (NASA/MSFC/Fred Deaton)

Representatives from Therapy Partners Inc. of Huntsville, accompanied by their furry friend, offered information to SHE Day participants about their organization and answered questions in Activities Building 4316. The organization provides professionally trained and certified teams of handlers and animals to work as a therapeutic tool in hospitals, schools, long-term care facilities and other appropriate settings. Therapy Partners was one of more than 40 nonprofit organizations and companies that participated in SHE Day. (NASA/MSFC/Fred Deaton)

Marshall team members take some time to relax during a "yoga for anxiety" class, part of SHE Day activities. (NASA/MSFC/Fred Deaton)

A representative from Huntsville Utilities gives a fiery demonstration on energy awareness at SHE Day. Other activities and exhibits included a self-defense class and a HEMSI search-and-rescue dog demonstration. (NASA/MSFC/Fred Deaton)

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Marshall Center's Kevin S. Thompson Balancing Work, Family Life through Son's Cancer Battle

By Megan Davidson

Kevin S. Thompson, a Jacobs Engineering Group employee supporting the Marshall Space Flight Center's Advanced Concepts Office, and his wife, Alana Thompson, knew something was wrong when their perpetually happy son, Ryder, grew cranky, running a low-grade fever and developing what looked like a rash.

Image left: Kevin and Ryder Thompson (Special to the Star)

Just days before Ryder's first birthday last June, Alana Thompson took him to their family pediatrician. The diagnosis: Ryder's rash was actually tiny bruises, called pitikia -- a common symptom of leukemia. His parents were told to take him immediately to Birmingham Children's Hospital to undergo bone marrow tests.

Yet to his doctors' surprise, all tests came back normal. Recalls Kevin Thompson: "They told us he could have a virus, or was in the process of getting leukemia -- it doesn't just show up overnight."

This January, Alana Thompson noticed the pitikia again while bathing her son. Another visit to the doctor and additional tests confirmed the devastating diagnosis: Ryder, who loves to play outside and has a budding passion for music, did indeed have leukemia.

"Everything happened so fast," remembers Kevin Thompson. "The doctor told my wife, 'You have to get to Children's Hospital. Don't worry about packing or anything -- just go.' We had to make a lot of hard decisions very quickly."

Ryder was admitted to Children's Hospital on Feb. 1 and immediately began an aggressive chemotherapy treatment, which his doctors estimate will stretch out for more than seven months. Due to his young age and the possibility of infections, Ryder must live at the hospital until his treatment is complete.

Life drastically changed that bleak February day for the Thompson family, who had already been through the pain of learning both their sons had special needs. Seven-year-old Trey was diagnosed with Prader-Willi syndrome when he was 2 months. His disorder is the most commonly known genetic cause of life-threatening obesity in children.

The couple, who always wanted three children, decided to undergo genetic testing to find out how probable the chances were of having another child with special needs. "The testing wasn't going to be our only deciding factor whether we would have more children, but we wanted to be informed," says Kevin Thompson. No abnormalities came back from those tests, and the couple went on to have a healthy baby girl, Leia, now 5.

When Alana Thompson was seven months pregnant with Ryder, doctors detected problems with the baby. "All the doctors said we had a greater chance of winning the lottery than something being wrong with another child, especially after genetic

testing," says Kevin Thompson. But when Ryder was born, doctors diagnosed him with Down syndrome -- a chromosomal condition associated with intellectual disability, a characteristic facial appearance and poor muscle tone in infancy. The degree of intellectual disability varies, but it is usually mild to moderate. About 1 percent of children with Down syndrome develop leukemia.

"It was a really emotional time," recalls Kevin Thompson. "We felt defeated. We couldn't believe we were going through the same heartache that we did with Trey. As parents, we didn't want to see our children suffer in any way, or be looked at differently or picked on by their peers.

"Going through all that, and then finding out Ryder had cancer, was a big grief for our family. The day we found out about the leukemia, my wife and I just sat and stared at each other in disbelief. There really were no words to say. We were scared we were going to lose him."

The first few months in the hospital weren't easy for Ryder. He developed a couple of infections, and had a dangerous, zero blood count for 30 days, preventing him from undergoing further chemo treatments. However, the last few weeks have been better. Doctors say the treatments are working, and he completed his third round of chemo May 2.

"Ryder is doing really well right now," says his father. "I love that kid. Even at such a young age, he finds a way to make the best of his situation. The nurses call him 'Smiley' because even when he's sick from the treatments, he'll muster up a grin when they walk in the door.

"We are also encouraged that Ryder has actually grown hair since his first treatment. He's not ready to say goodbye to his 'do' just yet!"

Kevin Thompson says encouragement is just what the family needs after a difficult few months. His wife is staying with Ryder around the clock, so all the family members can be together only during visits to the hospital. In April, Kevin Thompson, Trey and Leia moved from the family's home in Hartselle to a Birmingham apartment -- provided rent-free by a church there -- to be closer to Alana Thompson and Ryder.

"It is hard on Trey and Leia," reflects their father. "They miss their parents. And Trey needs a lot of special care due to his syndrome, and my wife can't always be with him right now. But we are all trying to make the best of it. They love their brother and want him to get well. They are troupers."

His co-workers have donated several weeks of their vacation time to him so he can focus on his family. "My wife and I can't express our gratitude enough to the people at the Marshall Center," he says. "Since Ryder's diagnosis, we've received countless emails, phone calls, gifts and donations, including to a fund established for us at the Redstone Federal Credit Union. The support has melted our hearts -- we hope to pay it forward when Ryder is healthy again. Things are better, but we still have a long way to go."

Davidson, an AI Signal Research Inc. employee, supports the Office of Strategic Analysis & Communications.

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29 Marshall Engineers Graduate From Center's First Systems Engineering Leadership Development Program Level I Class

By Jessica Eagan

After two years of hard work, 29 Marshall Space Flight Center engineers recently graduated from the center's first Marshall Systems Engineering Leadership Development Program Level I class.

NASA has identified systems engineering as a critical core competency in enabling current and future mission success, and there exists a need to develop additional expertise in systems engineering as Marshall undertakes more complex missions.

As a result, the NASA Systems Engineering Leadership Development program was established to train representatives from each center, but the numbers of participants are very limited. Marshall developed its program in response to the agency program, and as a mechanism for further developing the systems engineering competency at the center and supplementing the training available at the agency level.

Scott Croomes, the development program's senior advisor and director of the Chief Engineers Office in Marshall's Engineering Directorate, presented certificates to Jarod Andrews, Jeri Briscoe, Thomas C. Bryan, Alicia S. Carroll, Katherine Stevenson-Chavis, Ruth Conrad, Angela V. Daniels, Ryan K. Decker, Robert C. Engberg, Hansel Gill, Gayleen N. Ijames, Kathy U. Jones, John Lassiter, Ashley R. Lee, Paul L. Luz, Travis D. Martin, Mario R. Martinez, Tresa K. Mitchell, George W. Olden, Tim Owen, Robert Polsgrove, Tara T. Polsgrove, David C. Reynolds, Jeremy Rousseau, Todd E. Steadman, Debra W. Terrell, Carole Wagner, Kenneth Whitley and Kenneth R. White.

"We are very proud of the Level I graduates and their accomplishments," said Phil Hall, co-program manager and flight systems engineer in the System Engineering Management Office in the Engineering Directorate. "One premise of the program was for the participants to step up and take charge, and they demonstrated this with the challenge of completing rotations and course work due to the change in direction of the agency and center. This verifies that these graduates can be some of our future leaders at the center."

"Investing in our employees through systems engineering training is very important since it's one of the core skills we need to maintain and mature in our engineering workforce," said Chris Singer, director of the Engineering Directorate. "Systems engineering is key to any successful project/program since it lays out the approach for managing the development of a product starting with initial requirements through product completion."

The graduates received hands-on experience to gain a clear understanding of systems engineering through rotational assignments within the Marshall Center, professional development workshops, and training courses focused on systems engineering and leadership development.

The Engineering Directorate and the Office of Human Capital jointly manage the program. Participants, with the approval and advocacy of their supervisor, applied for the program, underwent an interview process and were determined to meet the criteria for entry into the program. To be considered, applicants must have a degree in engineering, science or mathematics, possess a strong aptitude and interest in systems engineering, and show tremendous individual initiative and leadership potential.

The program consists of two levels. Level I targets early career civil service employees and is focused on systems engineering skills, and Level II targets mid-career civil service employees and is focused on the leadership competency. Participants have up to two years to complete each level of the program. Calls for both levels will be issued in the coming months.

For additional information, contact Hall at 544-2525 or at phillip.b.hall@nasa.gov.

Eagan, an AI Signal Research Inc. employee and the Marshall Star editor, supports the Office of Strategic Analysis & Communications.

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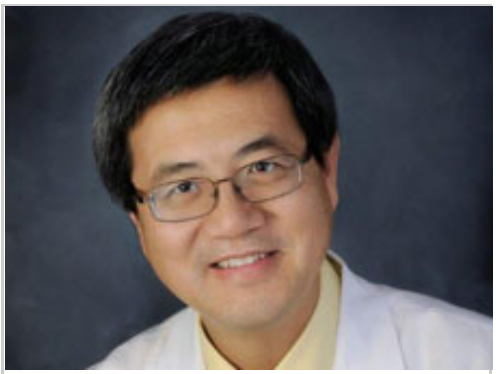
Marshall Center to Celebrate Asian-Pacific American Heritage Month in May

The Marshall Space Flight Center will recognize Asian-Pacific American

Heritage Month with two events in May. Marshall will first host an observance program in Building 4200, conference room 900 at 1:30 p.m. on May 17. Guest speaker is Dr. Jeremy Hon -- an oncology specialist at the Clearview Cancer Institute in Huntsville.


Dr. Jeremy Hon will address Team Redstone on May 17. (Photo Courtesy)

Hon was born in Hong Kong and immigrated to the United States in 1973. He earned a bachelor's degree in pharmacy from Samford University in Birmingham and finished his internship at the Children's Hospital there. While working as a registered pharmacist at the University Hospital in Birmingham, he enrolled in the University of Alabama in Birmingham's School of Medicine. Hon's internship and residency in internal medicine were completed at the University of Texas Health Science Center in Houston.

Hon has practiced medicine in Huntsville as a board-certified internal medicine and medical oncology physician since 1985.

Public speaker and activist Christine Chen will be the keynote speaker at the second event May 22 hosted by Team Redstone -- which includes the Marshall Center and U.S. Army organizations on Redstone Arsenal. The presentation begins at 10 a.m. in Bob Jones Auditorium at the Sparkman Center, Building 5304.

In 2001, Newsweek magazine profiled Chen as one of 15 women who will shape America's new century. She served as national executive director of the Organization of Chinese Americans from 2001 to 2005, expanding leadership, scholarship and internship programs for thousands of students. She also has been a member of the executive committee of the Leadership Conference on Civil Rights and has served on numerous boards and committees.

Chen is currently serving on the Kennedy Center Community Advisory Board, Demos Board of Trustees and the advisory board for the Progressive Majority Racial Justice Campaign. Her work at the grassroots and national levels has established her as a strong voice in the Asian-Pacific American community.

The Asian-Pacific American Heritage Month events are sponsored by Marshall's Office of Diversity & Equal Opportunity.

To learn more about the history of Asian-Pacific Americans, visit http://www.AsianPacificHeritage.gov.

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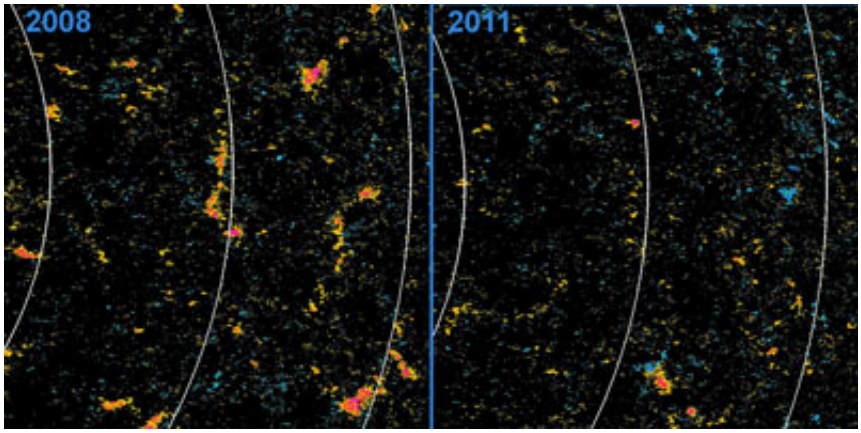
Hinode, Solar Heliospheric Observatory Paint an Asymmetrical Picture of the Sun

From nasa.gov



Approximately every 11 years, the magnetic field on the sun reverses completely -- the north magnetic pole switches to south, and vice versa. It's as if a bar magnet slowly lost its magnetic field and regained it in the opposite direction, so the positive side becomes the negative side. But, of course, the sun is not a simple bar magnet and the causes of the switch, not to mention the complex tracery of moving magnetic fields throughout the 11-year cycle, are not easy to map out.

Image left: In 2008 in the northern hemisphere of the sun, left, the Hinode X-ray Telescope observes large patches of negative polarity, shown in orange. In 2011, right, the same area shows much smaller patches and a more even

distribution of negative and positive regions, shown in blue. (JAXA/Hinode)

Mapping such fields, however, is a crucial part of understanding how -- and, in turn, when -- the sun will exercise its next flip. This flip coincides with the greatest solar activity seen on the sun in any given cycle, known as "solar maximum."

While the cycle unfolds with seeming regularity every 11 years, in two upcoming papers scientists highlight just how asymmetrical this process actually is. Currently the polarity at the north of the sun appears to have decreased close to zero -- that is, it seems to be well into its polar flip from magnetic north to south -- but the polarity at the south is only just beginning to decrease.

"Right now, there's an imbalance between the north and the south poles," says Jonathan Cirtain, a solar scientist at the Marshall Space Flight Center who also is NASA's project scientist for a Japanese solar mission called Hinode. "The north is already in transition, well ahead of the south pole, and we don't understand why."

One of the two papers relies on Hinode data that shows direct observations of this polar switch. The other paper makes use of a new technique observing microwave radiation from the sun's polar atmosphere to infer the magnetic activity on the surface. The asymmetry described in the papers belies models of the sun that assume that the sun's north and south polarities switch at the same time. In addition, both papers agree that the switch is imminent at the north pole, well in advance of general predictions that solar maximum for this cycle will occur in 2013. Lastly, the direct Hinode results also suggest a need to re-examine certain other solar models as well.

Measuring the magnetic activity near the poles isn't easy because all of our solar telescopes view the sun approximately at its equator, offering only an oblique view of the poles, when they require a top-down view for accurate magnetic measurements. Hinode can observe this activity annually with its high-resolution Solar Optical Telescope that can map magnetic fields when observing them from near the equator. The microwave radiation technique described in the second paper makes use of the discovery in 2003 that as the sun moves toward solar maximum, giant eruptions on the sun, called prominence eruptions -- which during solar minimum, are concentrated at lower solar latitudes -- begin to travel toward higher latitudes near the poles. In addition, the polar brightness in the microwave wavelengths declines to very low values.

"These prominence eruptions are associated with increased solar activity such as coronal mass ejections, or CMEs, so CMEs originating from higher latitudes also point to an oncoming solar maximum," says Nat Gopalswamy, a solar scientist at the Goddard Space Flight Center. Gopalswamy is the first author on the microwave observations paper, which was accepted by The Astrophysical Journal on April 11. "When we start to see prominence eruptions above 60 degrees latitude on the sun, then we know that we are reaching solar maximum."

To look at the prominence eruptions toward the poles, Gopalswamy and his team used observations from Japan's Nobeyama Solar Radio Observatory telescopes and the joint European Space Agency/NASA mission the Solar Heliospheric Observatory, or SOHO. They watched the sun in the microwave wavelengths -- which are used to observe the area of the sun's atmosphere just above the surface, known as the chromosphere. Gopalswamy created precise techniques to use such microwave radiation to measure the intensity of magnetic activity on the sun's surface at the poles. By mapping the brightness of the microwave radiation throughout the chromosphere, the scientists showed that the intensity at the north pole has already dropped to the threshold that was reached in the last solar maximum cycle, suggesting the onset of solar max there. This is backed by the fact that prominence eruptions are also occurring at high latitudes in the north. Eruption activity in the south half of the sun, however, is only just beginning to increase. The first CME occurred there in early March 2012.

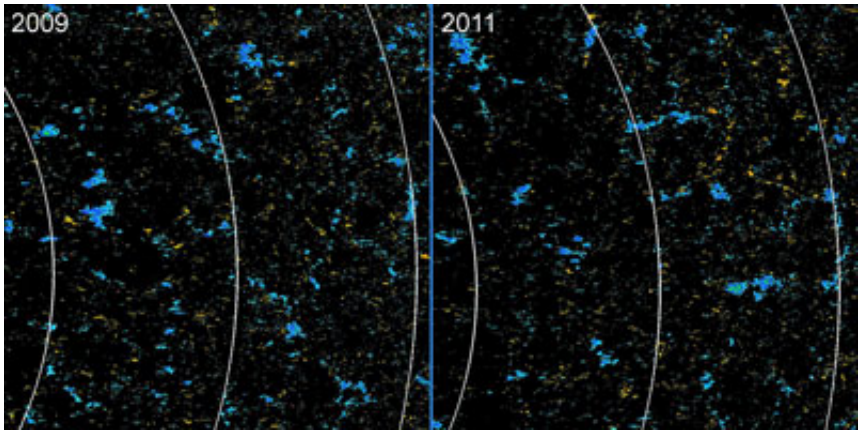


Image right: These images from Hinode show magnetism in the southern hemisphere in 2009, left, and 2011, right. The large blue patches show regions of positive polarity, which remain present even in 2011. (JAXA/Hinode)

The Hinode data also shows this discrepancy between the north and the south. The Hinode results are reported by a Japanese team led by Daikou Shiota, a solar scientist at RIKEN Institute of Physics and Chemical Research, and were recently submitted to The Astrophysical Journal for publication. Shiota and his team used Hinode to observe the magnetic map of the poles every month since September 2008. Early maps showed large, strong concentrations of magnetic fields that are almost all magnetically negative in polarity. Recent maps, however, show a different picture. Not only are the patches of magnetism smaller and weaker, but now there is a great deal of positive polarity visible as well. What once pointed to a strongly negative north pole, is now a weakly magnetized, mixed pole that will become neutral -- which occurs at solar maximum -- within the month, according to the team's predictions.

"This is the first direct observation of this field reversal," says Cirtain. "And it is extremely important to understanding how the sun's magnetism generates the solar cycle."

Ted Tarbell, the principal investigator for Hinode's Solar Optical Telescope at Lockheed Martin in Palo Alto, Calif., points out that the direct measurements showed the progress of the pole reversal, and highlights the earlier portion of the cycle in 2008. Typical models of the magnetic flip suggest that as active regions rotate around the equator, their higher, trailing edge -- which is almost always the opposite polarity from the pole in their hemisphere -- drift upward, eventually dominating the status quo and turning positive to negative or negative to positive. The Hinode data show that this transition at the north began before such drifting had a chance to occur.

"This is one of the most interesting things in this Hinode paper to me," says Tarbell. "How did the polar reversal start so early, even though the onset of the solar cycle, that is, increased activity at lower latitudes, hadn't begun yet?" Tarbell thinks these observations mean that this model, too, may need to be re-examined.

Such adjustments to models are, of course, expected whenever new and better data is collected. Indeed, David Hathaway, a solar scientist at Marshall who is co-author on the microwave observations paper with Gopalswamy, points out that the idea that asymmetries exist in the sun is not completely new. Other work has recently emphasized symptoms of this asymmetry, measuring, for example, more sunspots in the northern hemisphere than in the south at the moment. "But most of the well-developed models don't incorporate the asymmetry in them," Hathaway says. "More complicated models that incorporate asymmetries do exist, but they have other ways in which they fail to match observations."

Continued study on these differences, using the best observatories as well as new techniques for analysis, will help expand and improve our understanding of the sun, its 11-year cycle, and the great eruptions that occur on its surface.

Scientists also will keep their eye on the current cycle -- numbered Solar Cycle 24 -- because a polar switch at the north that is sooner than was expected also implies this may be a fairly small cycle in terms of the number of sunspots and amount of solar activity.

Hinode is joint Japanese Aerospace Exploration Agency/NASA mission to study the connections of the sun's surface magnetism, primarily in and around sunspots. The Marshall Center manages Hinode science operations and oversaw development of the scientific instrumentation provided for the mission by NASA. The Smithsonian Astrophysical Observatory in Cambridge, Mass., is the lead U.S. investigator for the Hinode X-ray Telescope.

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Marshall Co-Develops First Commercial Engineering Prototype of Fiber-Optic Liquid Mass Flow Sensor

Triad Technologies, LLC, of Lafayette, La., has teamed with the Marshall Space Flight Center, the University of Alabama in Huntsville and K-Sciences of Huntsville to design and fabricate the first commercial engineering prototype of the Fiber-Optic Liquid Mass Flow Sensor. From left are Tim Daigle, president of Triad Technologies; and inventors Don Gregory of UAHuntsville, Kevin Pedersen of Marshall's Engineering Directorate, Val Korman of K-Sciences, John Wiley of Marshall's Engineering Directorate and Sammy Nabors of Marshall's Technology Transfer Office. The prototype was co-developed by Marshall to provide a minimally invasive and low-cost solution for measuring multiphase flow -- the concurrent movement of free gas and liquids -- in pipes. It is scheduled to be tested on an existing oil well in Texas. If successful, the device could significantly impact the gas and oilindustry by helping to reduce infrastructure costs and provide more accurate real-time data to production operators and reservoir engineers. The Fiber-Optic Liquid Mass Flow Sensor, licensed by Triad Technologies, is an example of how a NASA-developed technology can be used to fulfill an unexpected industry application. Marshall's Technology Transfer Office helps industry benefit from inventions by widely disseminating the technologies for scientific, academic, industrial and commercial use. The technologies are patented, marketed and licensed to industry partners for commercial applications. (Photo courtesy)

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