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GoddardView

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Scientists See Light

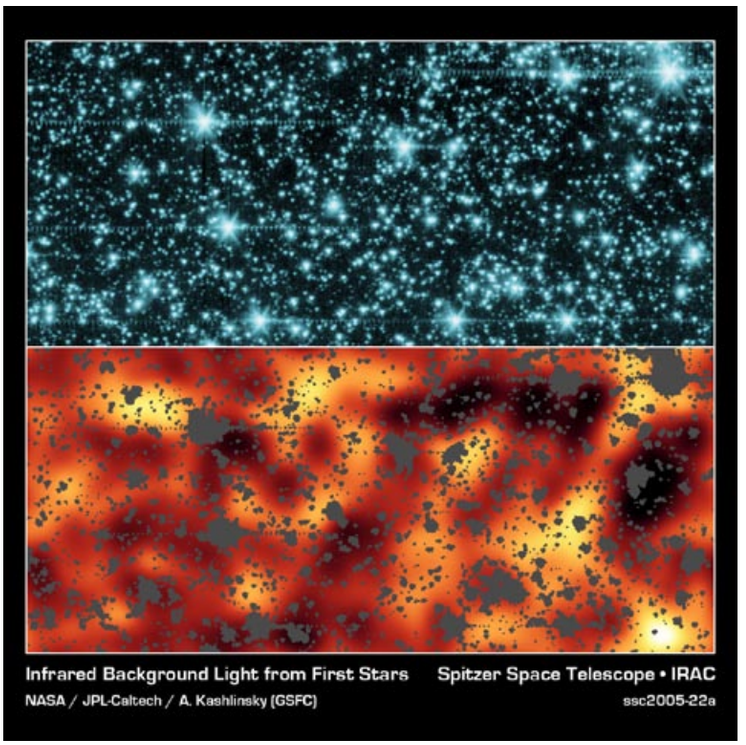
By Christopher Wanjek

Scientists using NASA's Spitzer Space Telescope say they have detected light that may be from the earliest objects in the universe. If confirmed, the observation provides a glimpse of an era more than 13 billion years ago when, after the fading embers of the theorized Big Bang gave way to millions of years of pervasive darkness, the universe came alive.

This light could be from the very first stars or perhaps from hot gas falling into the first black holes. The science team, based at NASA Goddard Space Flight Center in Greenbelt, MD., describes the observation as seeing the glow of a distant city at night from an airplane. The light is too distant and feeble to resolve individual objects.

"We think we are seeing the collective light from millions of the first objects to form in the universe," said Dr. Alexander Kashlinsky, Science Systems and Applications scientist. "The objects disappeared eons ago, yet their light is still traveling across the universe."

Scientists theorize that space, time and matter originated 13.7 billion years ago in a Big Bang. Another 200 million years would pass before the era of first starlight. A 10–hour observation by Spitzer's infrared array camera in the constellation Draco captured a diffused glow of infrared light, lower in energy than optical light and invisible to us. The Goddard



team says that this glow is likely from Population III stars, a hypothesized class of stars thought to have formed before all others. (Population I and II stars, named by order of their discovery, comprise the familiar types of stars we see at night.)

Theorists say the first stars were likely over a hundred times more massive than Earth's sun and extremely hot, bright, and short–lived, each one burning for only a few million years.

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Cover: Matter clumps under the force of gravity, then the first stars ignite and finally the structures of galaxies form.

Image Credit: NASA/GSFC

GoddardView Info

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Web-Based Training to Assist with Managing Your Career

By Trusilla Steele

Do you want to enhance and maximize your career development at Goddard? There are many talented and skilled employees here at Goddard, which is evident through Goddard's successful missions and achievements. What better way to continue to reach for success within an ever-changing workplace than by managing your career skills and keeping current on the latest resources for career development at Goddard. By ensuring that you possess the skills needed for career transition or for career growth, you can contribute towards maintaining a competent and highly motivated workforce. In working towards that objective, Goddard wants you to begin assessing your career skills by becoming aware of the career development resources and processes available.

An *Employee's Guide to Career Development and Performance Management* is the first required step to begin assessing your career skills. The purpose of this required web-based training (WBT) course is to bring awareness to civil servants, including supervisors about the revised performance management system; to make employees aware of the responsibility they have to take control of their own career development; and to offer employees guidance on seeking and receiving effective developmental feedback and career-enhancing opportunities. All of this information is essential for managing one's career. Also, "The Guide" is designed for employees to gain familiarity with:

- Career Management - Definition
- Generating an IDP
- Review of Performance Management System
- Enhancing Performance Management Communication
- Resources that can enhance career planning

Since this Guide contains information on the revised performance management system all employees, including supervisors must complete this training by December 15, 2005. Executive council will be notified of employees who fail to meet the completion date.

By taking responsibility for your career, you gain the confidence of being able to craft your skills in the direction of the constantly changing workforce. In addition to having career satisfaction and security, you will have alternate forms of enrichment. Know what it takes to move ahead, know the entire career and performance management process.

To take the web based training, visit:
https://solar.msfc.nasa.gov/solar/delivery/public/html/newindex.htm

Proposal Opportunities

NASA Research Announcements (NRA)

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

Research Opportunities in Space and Earth Science (ROSES)

Earth Space Science Fellowship/06
Solicitation: FELLOWSHIP06
Release Date: 2005-10-01
Proposal Due Date: 2006-02-01

Hubble Space Telescope – Cycle 15 Call for Proposals
Release Date: 2005-10-05
Proposal Due Date: 2006-01-27

NASA Astrobiology Institute – Cycle 4
Solicitation: NNH05ZDA001C
Release Date: 2005-07-25
Proposal Due Date: 2005-10-28

Radiation Belt Storm Probes Investigations and Geospace-Related Missions of Opportunity
Solicitation: NNH05ZDA003O
Release Date: 2005-08-23
Proposal Due Date: 2005-11-22

For more information contact the New Opportunities Office
x6-5442

Science Learning Rises from the Northern Plains

By Christopher Wanjek

When Ted Gull walked in the center of the grand entry processional at the Black Hills powwow in October, he wished he had some type of invention far better than his feeble camera that could truly capture the sights and sounds swirling around him.

The drums and chants and colors of ornate feathered costumes collided as hundreds of Native American dancers from several tribes across the northern plains officially opened this three-day celebration of Lakota, Dakota and Nakota culture.

To have this perspective from the heart of the procession was an honor rarely given to a non-Native American. For Ted, this was a high point in his fifteen years of fostering science and engineering education on Indian reservations in South Dakota. He and the recently retired Fritz Hasler of NASA Goddard, also part of the procession, would speak to the crowd that morning and again in the evening about astronomy and earth science.

Since 1991, Ted has worked with the South Dakota School of Mines and Technology and Oglala Lakota College to inspire Native American students to pursue advanced degrees. As with minority students in other regions of the nation, the odds are stacked against these young people. Reservation life, while often spiritually rewarding, can be rife with poverty, poor health, depression and despair. Unemployment hovers around 90 percent. The western part of the state is among the poorest in the nation, with many rural areas lacking public funds to support more than four days of school a week.

With support from the NASA Scientific Knowledge for Indian Learning and Leadership (SKILL) program and on his own initiative, Ted has visited South Dakota reservations dozens of times. He has worked directly with teachers, local politicians and tribal elders in creating summer education programs and school curriculum. When Ted started, colleges were graduating about 50 Native American students per year with advanced degrees nationally. Today that number is 100. The 28 tribal colleges (five of which are in South Dakota) have also excelled in providing more science, math and engineering opportunities, particularly through two-year certificate programs.

"That to me shows progress," Ted said. "If you treat a person as a person and not a lower-level student, they are going to perform well."

Ted draws a comparison to the historically Black colleges in America after the Civil War. It took decades, but these institutions forever changed the lives of young African Americans, and the nation as a whole reaped the benefits. Similarly, with long–term commitment and patience, Ted says we can see grand improvements in Native American education in our lifetime. ■

Photo Credit: NASA

Grand entry processional at the Black Hills powwow.

Scientists See Light

Continued from Pg. 2

The ultraviolet light that Population III stars emitted would be re-shifted, or stretched to lower energies, by the universe's expansion. That light should now be detectable in the infrared.

"This deep observation was filled with familiar-looking stars and galaxies," said Dr. John Mather, senior project scientist for JWST. "We removed everything we knew—all the stars and galaxies both near and far. We were left with a picture of part of the sky with no stars or galaxies, but it still had this infrared glow with giant blobs that we think could be the glow from the very first stars."

This new Spitzer discovery agrees with observations from the NASA Cosmic Background Explorer (COBE) satellite from the 1990s that suggested there may be an infrared background that could not be attributed to known stars. It also supports observations from the NASA Wilkinson Microwave Anisotropy Probe from 2003, which estimated that stars first ignited 200 million to 400 million years after the Big Bang.

"This difficult measurement pushes the instrument to performance limits that were not anticipated in its design," said team member Dr. S. Harvey Moseley, instrument scientist for Spitzer. "We have worked very hard to rule out other sources for the signal we observed."

The low noise and high resolution of Spitzer's infrared array camera enabled the team to remove the fog of foreground galaxies, made of later stellar populations, until the cumulative light from the first light dominated the signal on large angular scales. The team, which also includes Dr. Richard Arendt, Science Systems and Applications scientist, noted that future missions, such as NASA's James Webb Space Telescope, will find the first individual clumps of these stars or the individual exploding stars that might have made the first black holes.

This analysis was partially funded through the National Science Foundation. The Jet Propulsion Laboratory, Pasadena, Calif., manages the Spitzer mission for NASA. Science operations are conducted at the Spitzer Science Center at the California Institute of Technology in Pasadena. NASA Goddard built Spitzer's infrared array camera which took the observations. The instrument's principal investigator is Dr. Giovanni Fazio, Smithsonian Astrophysical Observatory, Cambridge, Mass.

For graphics and more information about Spitzer visit:
http://www.spitzer.caltech.edu/Media ■

Inspiring The Next Generation

By Adam Mahone

During the weekend of October 22, 2005, more than 500 attendees from the metropolitan area were invited to attend the first ever WDC Science, Technology, Engineering and Mathematics (STEM) Summit. Held at Kelly Miller Middle School in Northeast, Washington, D.C., the summit was a result of a unique partnership between NASA Goddard Space Flight Center (GSFC) and Anne Beers Elementary School, in Washington, D.C. and included parents, educators, civic leaders, and leaders in public policy and corporate America.

The WDC STEM Summit focused on promoting the significance and viability of science, technology, engineering, and mathematics in the District of Columbia for all students and faculty from pre-kindergarten to postsecondary settings. Led by faculty from the third year NASA Explorer School Anne Beers Elementary, NASA personnel, and other experts in the science, technology and engineering fields, this event featured a series of teaching and learning sessions.

During the Opening Ceremonies, Dr. Robert Gabrys, GSFC Chief Education Officer and Deputy Chief of Public Affairs, shared his thoughts on how to encourage the younger generation to work towards a STEM career. Following his presentation, Mark Branch, GSFC Aerospace Engineer, and Richard Varner, GSFC Aerospace Education Specialist, held concurrent sessions on new ways of teaching STEM curriculum and the Principles of Rocketry respectively. Later that day, Anne Beers Elementary School teachers Stephanie Harris, Valyncia Lindsey, and Padi Boyd, held sessions discussing their best practices for teaching using classroom technology. Other outstanding speakers in attendance included motivational speaker Willie Jolley, Bill Grimmette and Captain Edward W. Gantt of the United States Navy all of which shared their time and personal expertise with attendees.

The WDC STEM partnership is an "opportunity for NASA to inspire the next generation to pursue careers in science, technology and engineering by becoming a working partner in their neighborhood. Our shared vision is to make Washington, D.C. a national leader in STEM education," said Antoinette Wells, NASA Goddard Explorer School Program Manager.

According to Reverend Dr. Kendrick E. Curry, the Washington, D.C. program ambassador and chairperson for the summit, "NASA is a leader in science and technology education and the space agency has been actively involved in this partnership for a number of years. We appreciate Goddard's support and their approach was right on target. They were able to excite our students and faculty about careers in the sciences as never before."

Now that's inspiring the next generation of explorers as only NASA can… ■

NASA Mission to Study the Energetic Universe

By Susan Hendrix

Have you ever seen a picture of a galaxy with enormous jets of matter shooting out of its core, to distances far beyond the confines of the galaxy, and wondered how that could happen?

The answer is that there's a powerful black hole lurking in the galaxy's core. Thanks to Goddard, astronomers will soon have a superior tool for studying how these black holes, notorious for pulling matter in, also accelerate jets of gas outward at fantastic speeds. Physicists will be able to test basic laws of nature and search for signals of new types of matter; and cosmologists will be able to gain valuable insight about the birth and early evolution of the Universe. The mission that will attempt to accomplish all these feats is called the Gamma–Ray Large Area Space Telescope, or GLAST.

Goddard has the lead role to design and build the AntiCoincidence Detector (ACD) for the Large Area Telescope, the primary instrument aboard GLAST.

Since gamma–rays act more like high–energy subatomic particles (such as protons and electrons) than light, and because they cannot be reflected or focused, gamma–ray telescopes are a lot like the particle detectors used at places such as Fermilab and the Stanford Linear Accelerator Center. But because our atmosphere blocks gamma–rays from reaching the Earth's surface, we must study them from space.

However, an orbiting gamma–ray telescope finds itself in a sea of cosmic rays, solar particles, and particles which are trapped in the Earth's magnetic field. Such particles outnumber the gamma–rays that scientists are searching for by a factor of nearly 10,000.

"This is why the ACD needs to be highly efficient, 99.97% or better, in order to keep the particles from masquerading as gamma–rays," said ACD instrument scientist Dave Thompson of the Exploration of the Universe Division at Goddard. "It will do this by using special plastic scintillator detectors, which are sensitive to the particles, but not to the gamma–rays."

The detector cannot actually stop the particles from penetrating, so it will send an electronic signal to the rest of the Large Area Telescope when a particle arrives that basically says, "We don't want this one. It's a particle not a gamma ray." These signals allow the other detectors on the telescope to concentrate on seeing the gamma–rays that tell us about the powerful objects in the Universe that produced them.

The second instrument for this mission, built primarily by our colleagues at NASA Marshall, is the GLAST Burst Monitor, which will measure the energy spectrum of gamma–ray bursts. "Isn't the Swift mission also studying gamma–ray bursts?" you may ask, yes, but GLAST complements Swift by detecting a wider and more energetic range of gamma–ray energies.

Where the primary motivation for Swift is gamma–ray bursts, GLAST will be a more general purpose gamma–ray facility," said project scientist Steve Ritz at Goddard. "The mission will open a new and important window into a variety of high–energy phenomena, such as supermassive black holes and active galactic nuclei, supernova remnants, and cosmic-ray acceleration."

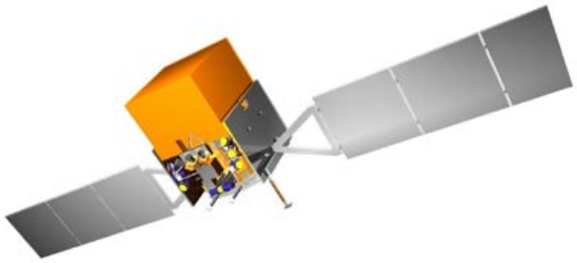

Diagram of the GLAST instrument. Image courtesy of SpectrumAstro.

Goddard manages the GLAST mission for NASA, providing science leadership, and overall mission systems engineering, as well as design and development of the Large Area Telescope ACD subsystem. After launch, Goddard will manage the GLAST Science Support Center and the Mission Operations Center.

GLAST is currently scheduled to lift off in September 2007 from NASA's Kennedy Space Center aboard a Delta II Heavy rocket. This international and multi–agency mission will build upon findings from the Energetic Gamma Ray Experiment Telescope aboard the Compton Gamma Ray Observatory.

For more detailed information about this mission, visit:
http://glast.gsfc.nasa.gov/

Did You Know?

Ear Thermometer

Using the same technology that measures the energy emitted by stars and planets, thermometers can measure human infrared heat in less than two seconds.

Sifting Through Star Dust

By Cynthia O'Carroll

Photo Credit: NASA

When Joe Nuth's brother asked his then 6-year old daughter, Bridget, what her Daddy did for NASA, she replied, "He makes dirt—big people dirt." As the Chief of Goddard's Astrochemistry Laboratory, Nuth and his research team do make dirt, star dirt that is, laboratory versions of the gas and the dust that surround the stars and formed the planets in the solar system.

Nuth and his colleagues study chemical processes that produce dust around dying stars, the spectral properties of the dust and the changes that occur as it is heated to high temperatures, reacts with water vapor or is exposed to high levels of radiation. The spectral properties of these materials are compared to observations taken by a variety of ground–based and space-–based infrared instruments of newly forming stars or protostars, comets and dust produced in dying stars in order to properly interpret the observational data.

Years ago, astronomers thought that interstellar space only held stars, nebulae and galaxies since that is all that optical astronomy revealed. Once molecular hydrogen was discovered, many other molecules were detected, including carbon monoxide, hydrogen, ammonia, methane and water.

Although these elements are found on Earth, molecules often react differently in space due to the much lower densities and temperatures and higher levels of radiation. More than 100 different molecules have been observed in various astrophysical environments including amino acids, alcohols and very long chain hydrocarbons; a class of compound that would never be found naturally on Earth and that is only stable in very low-density space environments.

The task of the members of the Astrochemistry Laboratory is to compare the observed properties of interstellar, circumstellar or solar system material, obtained from satellite instruments, to what can be studied on Earth in a laboratory setting. For instance, the Hubble Space Telescope collects spectra from protostars at a variety of ages as they form and evolve and the scientists try to match these spectra and measure the strength of the individual spectral features to help make sense of the observations from space. Laboratory data are even more critical in the interpretation of measurements made by infrared missions such as the Infrared Space Observatory, the James Web Space Telescope and the Spitzer Space Telescope because the infrared region contains a wealth of chemical information that indicates both the composition and the structure of the material under observation.

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Above and Beyond

By Amy Pruett

When Richard Varner, GSFC Aerospace Education Specialist, gave a Return to Flight presentation to a 5th grade class at Hollifield Station Elementary in Ellicot City, MD on September 28, he was surprised by a question he received from a student. About a week following his visit to the school, he received a letter from one of the 5th graders, Alex, expressing interest in NASA, but also specifically the movie October Sky. Varner could see a future NASA scientist in the making, so he went above and beyond his duty to create a special memory for Alex.

Right away, Varner tracked down the official October Sky website and discovered an email address for Homer Hickam, the author and main character of the book Rocket Boys that the movie is based on. He emailed Hickam, asking him to send a note to the child. Hickam responded immediately with a lengthy email addressing Alex personally, urging him to continue to pursue a career in space science.

"It was clear to me that this one event could potentially inspire Alex to pursue a career in science, and I wanted him to remember that NASA had a part in it," says Varner. "Alex is at an age when adolescents are fascinated by many careers, it is important for scientists to grab and hold their interest at an early stage before others divert their attention."

In the letter, Hickam quotes from his book, "A rocket won't fly unless somebody lights the fuse." He urges Alex to avidly pursue his dreams, seek aid from mentors and teachers, look for opportunities that will allow him to achieve his goals, and to never allow setbacks to stop progress. "You must learn to move, to exert yourself, to let dreams translate into reality through hard work, study, and working with other people." says Hickam.

While Hickam is not a NASA employee, he supports the NASA mission and is constantly seeking out opportunities to inspire the next generation of rocket scientists. Just like Varner he went above and beyond his duty to reach out to a 5th grade student, realizing that children such as he are our future. ■

Sifting Through Star Dust

Continued from Pg. 7

"I became hooked on the NASA mission to explore the Solar System and beyond in elementary school and I have always wanted to be a part of NASA," stated Nuth. "Early in my career, I once mentioned to my mother that I was considering applying for a job at a university. She was quite disappointed that I would even consider leaving NASA and asked if I were crazy."

Nuth's team studies processes that occur around the stars and the planets to better understand both what might have happened billions of years ago when the solar system evolved, as well as to learn what is happening today at Mars, Saturn, Titan or beyond the solar system.

Regina Cody of the Astrochemistry laboratory measures the rates of chemical reactions in planetary atmospheres, while John Allen measures the vapor pressures of gas-phase compounds such as ammonia, methane or hydrogen sulfide at temperatures as low as 55Kelvin (K) (-360F) in order to model the chemistry in the atmospheres of the outer planets and their satellites.

Peter Wasilewski measures the magnetic properties of rocks and minerals to understand the nature and origin of magnetic minerals on Mars or the processes that generated intense magnetic fields in the solar nebula. Marla Moore studies the spectral properties of ices both before and after exposure to intense levels of radiation in order to interpret infrared observations of ices in dark molecular clouds. Jason Dworkin studies the traces of complex organic materials made during the irradiation of these ices in studies of the potential for generating some of the essential biogenic compounds, such as amino acids, necessary for the origin of life.

A major activity in the Astrochemistry Laboratory is designing and flying instruments to measure the x-ray or gamma ray emission from solid bodies such as the asteroid, Eros, the Moon or Mars.

Jack Trombka has also developed a new handheld x-ray detector currently being tested for the National Institute of Justice to study crime scenes for clues and relevant material such as gun shot residue. After they are perfected, these detectors will become off-the-shelf commercially available items. These same detectors will also be used to explore the surface of planets such as Mars. Trombka leads a group of scientists and engineers who not only use the instruments but also build, calibrate and are working to find ways to automate interpretation of the data. Civil service members of this team include Sam Floyd, Tim McClanahan, Nim Mankung and Lucy Lim. John Keller, Deputy Project Scientist for the Lunar Reconnaissance Orbiter also collaborates with Jack Trombka and others in the design of unique analytical instruments for future planetary missions. ■

Employee Spotlight

Winnie Humberson

By Alana Little

Photo Credit: Pat Izzo

One NASA, a concept birthed over two years ago at a NASA leadership course, is defined as "One team optimally applying many unique capabilities in the pursuit of One shared vision." One NASA is not only a company vision, but a tangible way to enable NASA to optimize the use of Agency resources for the common good, and to foster more collaboration across the Agency, thus promoting more efficient systems and processes Agency-wide. One NASA enables the Agency to accomplish those things that no one organizational element can possibly achieve on their own. One of the people who has been working toward this vision is Winnie Humberson.

Winnie has been with NASA as a contractor since 1980, currently working at Goddard through Science Systems and Applications Inc. for the Science Mission Directorate (SMD). She is currently heading the effort to combine Earth Science and Space Science under one umbrella, as envisioned by the One NASA concept.

Winnie works diligently with her team in the area of Earth Science and Space Science public outreach. Her task is sometimes a difficult one because she must publicize and promote Goddard Earth and Space Science programs at events like AGU and the Washington Home & Garden Show, on a minimum budget. Adam Mahone, Informal Education and Public Outreach Coordinator for the Solar System Enterprise and PAO Exhibit Manager, has had the pleasure of working with Winnie on many occasions, and believes Winnie is "an extremely valuable asset." Winnie is able to accomplish her goals by recruiting good people to be on her special project teams, and by utilizing the skills of other offices like Public Affairs. "I get special satisfaction from seeing a group of people become friends and then go on to become a very strong team," she said. ■