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Cosmologists Reveal First Detailed Images of Early Universe

An international team of cosmologists has released the first detailed images of the universe in its infancy. The images reveal the structure that existed in the universe when it was a tiny fraction of its current age and 1,000 times smaller and hotter than it is today. Detailed analysis of the images is already shedding light on some of cosmology's outstanding mysteries — the nature of the matter and energy that dominate intergalactic space and whether space is “curved” or “flat.”



The BOOMERANG Telescope being readied for launch.

The Balloon Observations of Millimetric Extragalactic Radiation and Geophysics (BOOMERANG) project, obtained the images using an extremely sensitive telescope suspended from a NASA scientific balloon that circumnavigated the Antarctic in late 1998. The balloon carried the telescope to an altitude of almost 120,000 feet (37 kilometers) for 10 1/2 days. The results of the study were published in the April 27 issue of *Nature* magazine.

The Wallops Flight Facility manages the scientific balloon program for NASA.

Today, the universe is filled with galaxies and clusters of galaxies. Twelve to 15 billion years ago, following the theorized Big Bang, the universe was very smooth, incredibly hot and dense. The intense heat that filled the embryonic universe is still detectable today as a faint glow of microwave radiation visible in all directions. This radiation is known as the cosmic microwave background (CMB). Since the CMB was first discovered by a ground-based radio telescope in 1965, scientists have eagerly sought to obtain high-resolution images of this radiation.

NASA's Cosmic Background Explorer satellite discovered the first evidence for structures, or spatial variations, in the microwave background in 1991.

The BOOMERANG images are the first to bring the cosmic microwave background into sharp focus. The images reveal hundreds of complex regions visible as tiny variations in the temperature of the CMB. The complex patterns visible in the images confirm predictions of the patterns that would result from sound waves racing through the early universe, creating the structures that by now have evolved into giant clusters and super-clusters of galaxies.

“The structures in these images predate the first star or galaxy in the universe,” said U.S. team leader Andrew Lange of the California Institute of Technology, Pasadena. “It is an incredible triumph of modern cosmology to have predicted their basic form so accurately.”

Italian team leader Paolo deBernardis of the University of Rome La Sapienza added: “It is really exciting to be able to see some of the fundamental structures of the universe in their embryonic state.”

The BOOMERANG images cover about 3 percent of the sky. The team's analysis of the size of the structures in the cosmic microwave background has produced the most precise measurements to date of the geometry of space-time, which strongly indicate that the geometry of the universe is flat, not curved.

This result is in agreement with a fundamental prediction of the “inflationary” theory of the universe. This theory hypothesizes that the entire universe grew from a tiny subatomic region during a period of violent expansion occurring a split second after the Big Bang. The enormous expansion would have stretched the geometry of space until it was flat.

The balloon, with a volume of 28 million cubic feet (800,000 cubic meters), carried the two-ton telescope 5,000 miles (8,000 km) and landed within 31 miles (50 km) of its launch site.

More information on and images of BOOMERANG can be found at: <http://www.physics.ucsb.edu/~boomerang/>

More information on the NASA Scientific Balloon Program can be found at: <http://www.wff.nasa.gov/pages/scientificballoons.html>

NASA Wallops and UMES Giving Students a New View of the Shore

NASA Wallops Flight Facility and the University of Maryland Eastern Shore, Princess Anne, Md., are teaming on a project for students to design a remote sensing system for coastal topography and vegetation features.

The project between the Wallops and the university is called UMES-AIR: Undergraduate Multidisciplinary Earth Science - Airborne Imaging Research. The mission is to design, build, and fly a mini-spectrometer on a tethered blimp at altitudes up to 1500 ft.

The flights will be conducted over the UMES campus and marsh areas of the Chesapeake Bay and over Wallops Island. Agricultural areas also may be observed. The first test of the system is expected by early May 2000.

UMES-AIR is designed to improve student motivation while involving them in an experiential learning and exploratory research activity pertaining to remote sensing. More than 20 students from mathematics, science, engineering and technology majors are actively involved in the project. Carlton Snow, GN&C Systems Engineering Branch, a rising junior in the new collaborative Electrical Engineering program at UMES with the University of Maryland's Clark School of Engineering at College Park, Md., is providing leadership to the student teams.

Geoffrey Bland, Observational Science Branch, is providing expertise to UMES faculty and students on this project that is partially funded by a grant from the NASA Goddard Space Flight Center.

Dr. Nagchaudhuri of the UMES Engineering and Aviation directs the Project Sciences department with strong support from Prof. Charles Elzinga of the Mathematics and Computer Sciences department.

Other UMES faculty, department chairs and staff who also are participating in the project include Dr. Gurbax Singh, Dr. Leon Copeland, Dr. Daniel Okumbor, Dr. Joseph Okoh, Dr. Ali Eydgahi, Dr. Roman Jesien, Ronney Spencer, Madhumi Mitra, Tracie Hedricks, Dr. Peter Ezekwenna, and Dr. Shawn White.

The project was initiated in 1999 and is in keeping with a memorandum of agreement between UMES and NASA Goddard Space Flight Center to promote such projects.

Jean Johnson Retires



Photo by Rick Huey.

Jean A Johnson (above) retired effective April 30, 2000 after more than 26 years of government service. A native of Gumboro, DE, Johnson began her career in 1962 in the Personnel Office at NASA's Dryden Flight Research Center. In 1965, Johnson went to work in the U.S. Air Force Inspector General's Office in Iraklion, Crete. Johnson began her career at Wallops shortly after returning to the Eastern Shore in 1966. She worked in several offices at Wallops until 1969 when she left to complete studies for a Bachelor's Degree and to teach in the Maryland public school system in Pocomoke and Snow Hill.

In 1980, Johnson returned to NASA Wallops. She worked in the Procurement Office, Aeronautical Programs Branch, Resource Office and was appointed Chief of the Resources Management Office in 1996. She was responsible for budget development and execution of all Directorate programmatic, manpower and institutional functions, as well as costing and resources accounting. Johnson has served on a number of Wallops and Center level committees and was awarded the NASA Exceptional Achievement Medal in 1993.



Winners in the Wallops Easter Egg Hunt are (left to right): Jordan Mellington, Jessica Lewis, Cari Parks, Seth Owens, Cody Quick and P. J. Johnson. Gerry McIntire, Event Coordinator (background) said 55 children took part in the annual hunt.

Library Corner

The Wallops Technical Library offers many on-line services. Employees have been able to search the book catalog and receive overdue notices by e-mail. Now they can renew book as well as request books or articles on-line. For on-line services go to the Library homepage: <http://library.gsfc.nasa.gov>

To receive overdue notices by e-mail contact Sam Hall: dhall@library.gsfc.nasa.gov or on x1065.

Federal Employees Political Activity

As political campaigns for election year 2000 get under way, Federal employees are reminded that the Hatch Act restricts the political activity of executive branch employees of the Federal government. The following is a list of Hatch Act do's and don'ts for Federal employees engaging in partisan political activity.

The Office of Special Counsel issues advisory opinions about political activity. You may request advice by phone, fax, mail or e-mail:

Hatch Act Unit
U.S. Office of Special Counsel
1730 M. Street, NW, Suite 300
Washington, DC 20036-4505
Tel: (800) 854-2824, (202) 653-7143
Fax: (202) 653-5161
E-mail: hatchact@osc.gov
Web Site: www.osc.gov

The following information applies to non-senior executive service federal employees.

DO's -- Federal employees may

- Be candidates for public office in nonpartisan elections
- Register and vote as they choose
- Assist in voter registration drives
- Express opinions about candidates and issues
- Contribute money to political organizations
- Attend political fund-raising functions

Are you recycling all that you can?

Wallops Flight Facility recycles several items that you may inadvertently be throwing in the trash. Dumpsters for scrap metal are located in the salvage yard and behind Building F-10. Dumpsters for cardboard are located at the Post Office and behind Receiving, Building F-19. Wooden pallets are collected in the Salvage Yard. White paper is collected in each office. The Black History Club collects aluminum cans in most buildings. Plastic bags are collected in the lobby of the Cafeteria. Packaging peanuts and bubble wrap can be turned into shipping.

The following items cannot be thrown in the trash. Non-food liquids, batteries, florescent light bulbs, solvent or oily rags, pressurized gas cylinders, asbestos or other hazardous materials. If you need to dispose of any of these items or have questions concerning other items that you would like to dispose of, contact the Environmental Office, x1718.

- Attend and be active at political rallies and meetings
- Join and be an active member of a political party or club
- Sign nominating petitions
- Campaign for or against referendum questions, constitutional amendments, municipal ordinances
- Make campaign speeches for candidates in partisan elections
- Distribute campaign literature in partisan elections
- Hold office in political clubs or parties.

DON'Ts -- Federal employees may not

- Use official authority or influence to interfere with an election
- Solicit or discourage political activity of anyone with business before their agency
- Solicit or receive political contributions (may be done in certain limited situations by federal labor or other employee organizations)
- Be candidates for public office in partisan elections
- Wear partisan political buttons on duty
- Engage in political activity while:
 - on duty
 - in a government office
 - wearing an official badge, uniform or other insignia that identifies the agency
 - using a government vehicle.

On the Road.....

Bob Reynolds, Facilities Management Branch served as a judge at the Regional Science Fair for Accomack and Northampton Counties held April 15 at the Eastern Shore Community College.

Debbie Fairbrother, Balloon Program Office, participated in a Take Our Daughters to Work Day, Breakfast Symposium on April 27 at Salisbury State University.

Allison Schauer, Science and Engineering Services, took part in a Career Day at Prince Street Elementary School on April 28.

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