

Home
President's Welcome

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Arts & Architecture
Environment
Health & Medicine
Humanities & Social Sciences
International
Science & Engineering
Campus

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Netcasts Videos
RSS Photos

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Poynter Fellowship
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Deepest Image of Universe Yet Reveals Most Distant Galaxies Ever Found

Published: January 5, 2010



Photo: NASA, ESA, G. Illingworth (UCO/Lick Observatory and the University of California, Santa Cruz), R. Bouwens (UCO/Lick Observatory and Leiden University), and the HUDF09 Team

New Haven, Conn. — An international team of astronomers has used the Hubble Space Telescope to take the deepest image of the universe ever, revealing the farthest and youngest known galaxies. The results, which could offer insights into how the first galaxies formed and evolved after the Big Bang, are being presented Jan. 5 at the American Astronomical Society meeting in Washington, D.C.

The infrared image was taken in August 2009 in the same region as the Hubble Ultra Deep Field (UDF), an area of the sky originally

imaged in 2004, using Hubble's newly installed Wide Field Camera 3. It required a total of more than 48 hours of exposure time to collect enough light to see "back in time" about 13 billion years—just 600 to 800 million years after the Big Bang—to the earliest known galaxies.

The HUDF09 team, which includes Yale University astronomer [Pieter van Dokkum](#), found that these early galaxies are compact and blue, suggesting they are free of dust and heavier elements that redden the light from galaxies. The finding lends support to the so-called hierarchical theory of galaxy formation, which suggests that galaxies progressively build up mass from surrounding matter or merge together into larger structures.

The galaxies discovered are only 1/20th the diameter and 1/100th the mass of our own Milky Way galaxy. But despite their diminutive size, the galaxies are forming stars at an extremely high rate, and appear to have begun forming stars even hundreds of millions of years earlier.

" These small, blue galaxies are the seeds that will grow into the large galaxies we see today," van Dokkum said. "It is exciting that we can now, for the first time, see and study these initial stages of galaxy formation."

The team combined its data with observations from NASA's infrared Spitzer Space Telescope to estimate the galaxies' masses and ages. However, their exact ages cannot be confirmed until the James Webb Space Telescope, scheduled to launch in 2014, can make spectroscopic observations of the galaxies.

" This is about as far as we can go to do detailed science with the new HUDF09 image," said Garth Illingworth of the University of California, Santa Cruz, and the HUDF09 project leader.

Other members of the HUDF09 team include Rychard Bouwens (University of California Observatories/Lick Observatory and Leiden University), Pascal Oesch and Marcella Carollo (Swiss Federal Institute of Technology, Zurich (ETH)), Marijn Franx (Leiden University), Ivo Labbe (Carnegie Institute of Washington), Daniel Magee (University of California, Santa Cruz), Massimo Stiavelli (Space Telescope Science Institute), and Michele Trenti (University of Colorado, Boulder).

For images and more information, visit:

<http://hubblesite.org/news/2009/31>

<http://www.spacetelescope.org/news/html/heic0916.html>

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