Astronomers Discover That Galaxies Are Either Asleep or Awake

Yale UniversityYale University

Bluer galaxies are actively “awake” and forming stars, while redder galaxies have shut down and are “asleep.” (Image: NASA, ESA, S. Beckwith (STScI) and the HUDF team)

New Haven, Conn. — Astronomers have probed into the distant universe and discovered that galaxies display one of two distinct behaviors: they are either awake or asleep, actively forming stars or are not forming any new stars at all.

Scientists have known for several years that galaxies in the nearby universe seem to fall into one of these two states. But a new survey of the distant universe shows that even very young galaxies as far away as 12 billion light years are either awake or asleep as well, meaning galaxies have behaved this way for more than 85 percent of the history of the universe. (Looking at galaxies farther away is like looking back in time when they were much younger, because of how long it takes the light they emit to reach us here on Earth.)

“The fact that we see such young galaxies in the distant universe that have already shut off is remarkable,” said Kate Whitaker [1], a Yale University graduate student and lead author of the paper, which is published in the June 20 online edition of the Astrophysical Journal.

In order to determine whether the galaxies were asleep or awake, Whitaker and her colleagues fabricated a new set of filters, each one sensitive to different wavelengths of light, which they used on a 4-meter Kitt Peak telescope [2] in Arizona. They spent 75 nights peering into the distant universe and collecting light from 40,000 galaxies ranging in distance from the nearby universe out to 12 billion light years away. The resulting survey is the deepest and most complete ever made at those distances and wavelengths of light.

The team deciphered the galaxies’ dual behavior based on the color of the light they emit. Because of the physics of star formation, active, wakeful galaxies

appear bluer, while the light emitted by passive, sleepy galaxies tends toward the redder end of the spectrum.

The researchers found that there are many more active galaxies than passive ones, which agrees with the current thinking that galaxies start out actively forming stars before eventually shutting down.

“We don’t see many galaxies in the in-between state,” said Pieter van Dokkum [3], a Yale astronomer and another author of the paper. “This discovery shows how quickly galaxies go from one state to the other, from actively forming stars to shutting off.”

Whether the sleeping galaxies have completely shut down remains an open question, Whitaker said. However, the new study suggests the active galaxies are forming stars at rates about 50 times greater than their sleepy counterparts.

“Next, we hope to determine whether galaxies go back and forth between waking and sleeping or whether they fall asleep and never wake up again,” van Dokkum said. “We’re also interested in how long it takes galaxies to fall asleep, and whether we can catch one in the act of dozing off.”

Other authors of the study include Ivo Labbé (Leiden University and Carnegie Observatories); Gabriel Brammer (Yale University and European Southern Observatory); Mariska Kriek (Princeton University and Harvard-Smithsonian Center for Astrophysics); Danilo Marchesini (Tufts University); Ryan Quadri and Marijn Franx (Leiden University); Adam Muzzin, Rachel Bezanson, Kyoung-Soo Lee, Britt Lundgren, Erica Nelson, Tomer Tal and David Wake (Yale University); Rik Williams (Carnegie Observatories); Garth Illingworth (UCO/Lick Observatory); and Gregory Rudnick (University of Kansas).

Citation: arXiv:1105.4609v1

PRESS CONTACT: **Suzanne Taylor Muzzin** [4] 203-432-8555

SOURCE [5]

Source URL (retrieved on *05/25/2013 - 9:21pm*):
http://www.ecnmag.com/news/2011/06/astronomers-discover-galaxies-are-either-asleep-or-awake

Links:
[1] http://www.astro.yale.edu/people/kate-whitaker
[2] http://www.noao.edu/kpno/
[3] http://www.astro.yale.edu/people/pieter-van-dokkum
[4] mailto://opac.yale.edu/news/suzanne.taylormuzzin@yale.edu
[5] http://opac.yale.edu/news/article.aspx?id=8669