# Help astronomers find 'baby' galaxies that give birth to new stars

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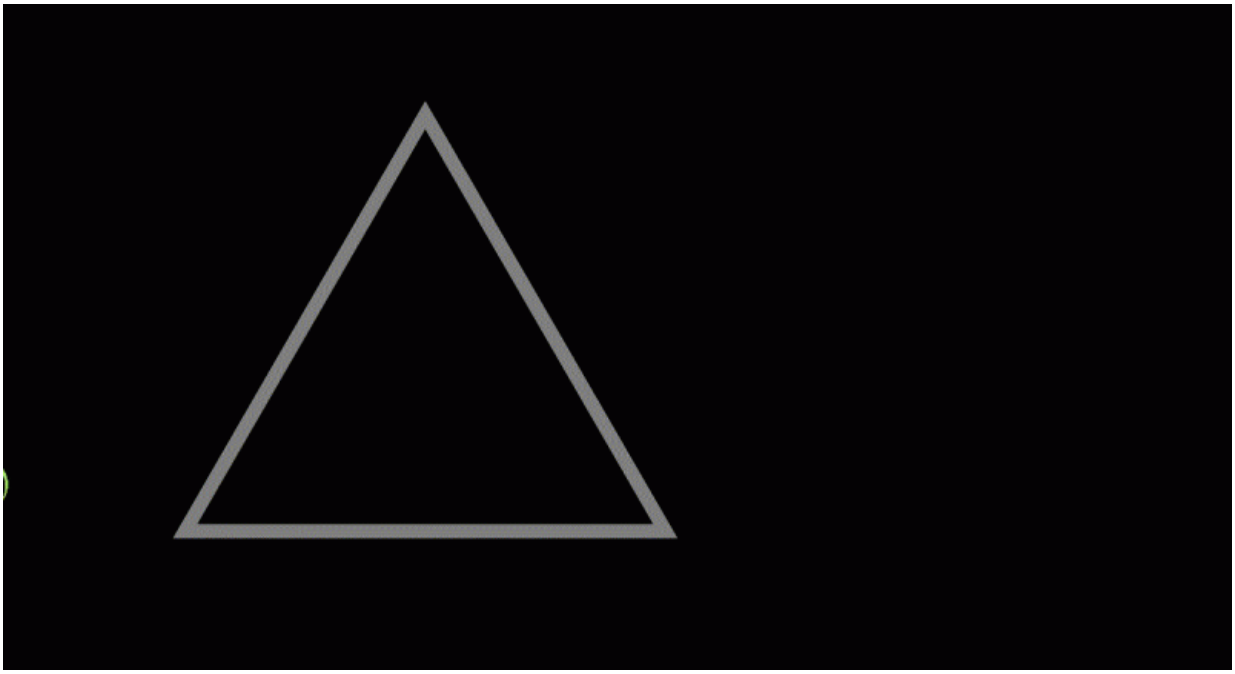


The animation above shows how white light from a galaxy going through a prism gets decomposed into all its colors—just like a rainbow. The figure shows how the different colors end up in different positions. In this example violet/blue toward the bottom, orange/red toward the top. At each color, we have an image of the galaxy.  Credit: University of Minnesota

A new citizen science project, led by astronomers at the University of Minnesota, is asking volunteers to help them with web classifications of galaxy spectra to find "baby" galaxies that are giving birth to new stars.

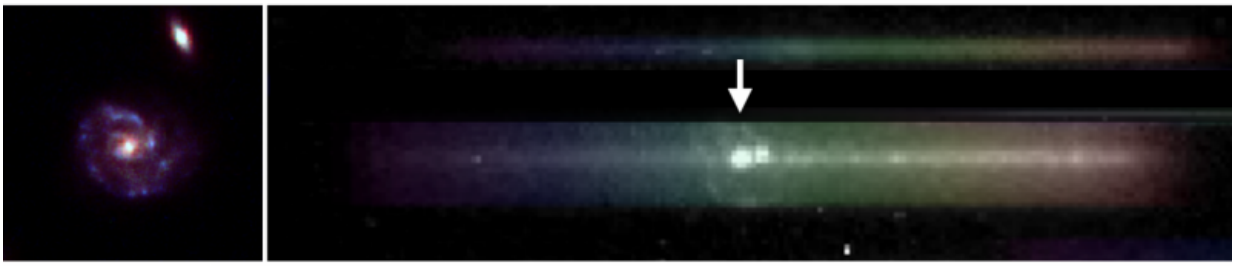
The project, named Galaxy Nurseries, marks the 100th project and 10-year anniversary of Zooniverse, the world's largest and most popular people-powered research platform.

"To celebrate the 100th project of Zooniverse, we are issuing a special challenge to the public to help us complete this new project in just 100 hours," said Claudia Scarlata, lead researcher on the Galaxy Nurseries project and University of Minnesota physics and astronomy associate professor. "Without help from the public, this project could have taken our team a year to complete the 40 classifications for each object."

The Zooniverse online platform runs on support from volunteers, which now number in the hundreds of thousands worldwide. These volunteers act as armchair scientists, helping the team with their online research from the comfort of their own homes.

Funded by NASA and the National Science Foundation (NSF), the main goal of this new Galaxy Nurseries project is to discover thousands of new baby galaxies in the distant Universe using the light they emitted when the Universe was only half of its current age. Accurately measuring the distances to these galaxies is crucial, but this is not an easy task. To measure distances, images are not sufficient, and researchers need to analyze galaxy spectra.

A spectrum is produced by decomposing the light that enters a telescope camera into its many different colors (or wavelengths). This is similar to the way that water droplets split white light into the beautiful colors of a rainbow after a storm.



The horizontal rainbows above show the spectra for the two objects on the left. The beautiful spiral galaxy at the center of the image is seen at it was 4 billion years ago. Researchers can say this because they see an emission line from hydrogen in its spectrum (indicated with an arrow). This emission line allows them to measure the galaxy's distance. Credit: University of Minnesota

This project uses the Wide Field Camera 3 carried by the Hubble Space Telescope to capture both images and spectra of hundreds of regions in the sky. The data allows researchers to find new galaxies (from the images) and simultaneously measure their distances (using the spectra).

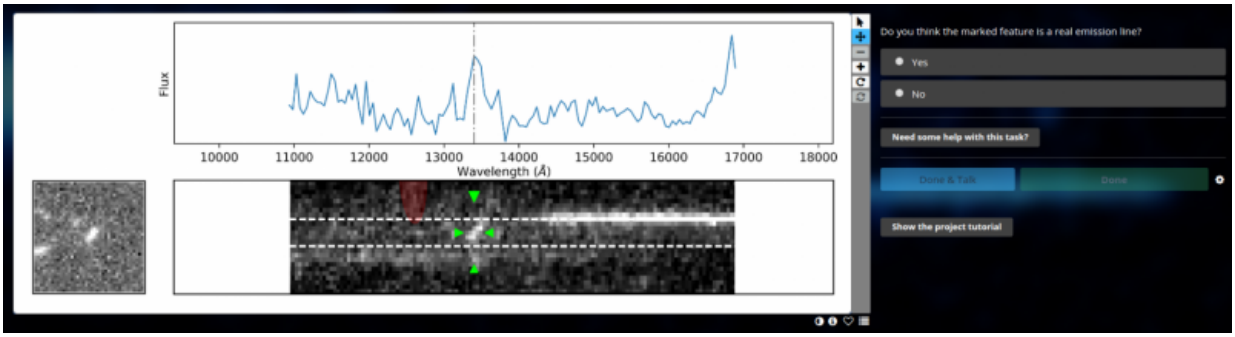
Researchers find galaxies by identifying features called "emission lines" in galaxy spectra. Emission lines appear as peaks in the spectrum and are produced when the presence of certain atomic elements in a galaxy (for example oxygen, or hydrogen), cause it to emit light much more strongly at a specific wavelength.

"The real trick is finding the emission line features in the galaxy spectra," Scarlata said. "Like many modern scientific experiments, we have written computer code that tries to identify these lines for us, but because our automatic line finder is only a machine, the code produces many bogus detections. It turns out that the visual processing power and critical thinking of people is much better than a computer in this case."

With help from Zooniverse volunteers, the researchers can eliminate the false positives and find galaxies that are some of the youngest and smallest that have ever been discovered.

Citizen scientists receive a tutorial on the Zooniverse platform before beginning their work. Together, the citizen scientists will examine more than 10,000 images from the Hubble Space Telescope. If citizen scientists are unsure about their classifications, the platform includes a discussion forum feature where they can talk with other citizen scientists.

"These classifications from citizen scientists will also be used to create a next-generation galaxy and line detection algorithm that is much less susceptible to being fooled and generating spurious detections," Scarlata said. "The work of all of these citizen scientists will be very valuable for the new NASA missions launched in the next decade."




Researchers find galaxies by identifying features called “emission lines” in galaxy spectra. Credit: University of Minnesota

To begin classifying images for the Galaxy Nurseries project, visit the Zooniverse website.

Zooniverse co-founder and University of Minnesota physics and astronomy associate professor Lucy Fortson said this new project highlights the great work of Zooniverse and citizen science.

"Over the past 10 years, the volunteers on Zooniverse have enabled a tremendous amount of science to be accomplished, including more than 100 peer reviewed papers," Fortson said. "But what amazes me the most is the dedication of our volunteer community. As we launch our 100th project, it is a real message of hope that so many people are interested in participating in the process of science."

Although it began as an astronomy platform, Zooniverse now features a number of international projects, covering fields ranging from humanities and biology, to the hugely popular ecology initiative, Penguin Watch.

Zooniverse is led by the University of Oxford and Chicago's Adler Planetarium in close collaboration with the member institutions of the Citizen Science Alliance, with particular leadership from the University of Minnesota-Twin Cities and the University of Portsmouth.

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Provided by University of Minnesota