AMERICAN MUSEUM of NATURAL HISTORY

Media Inquiries: Kendra Snyder, Department of Communications
212-496-3419; ksnyder@amnh.org
www.amnh.org

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CITIZEN SCIENTISTS UNCOVER A COLD NEW WORLD NEAR THE SUN

BACKYARD WORLDS VOLUNTEERS MAKE FIRST DISCOVERY: A COLD, CLOSE BROWN DWARF

A new citizen-science tool released earlier this year to help astronomers pinpoint new worlds lurking in the outer reaches of our solar system has already led to a discovery: a brown dwarf a little more than 100 light years away from the Sun. Just six days after the launch of the Backyard Worlds: Planet 9 website in February, four different users alerted the science team to the curious object, whose presence has since been confirmed via an infrared telescope. Details were recently published in *The Astrophysical Journal Letters*.

"I was so proud of our volunteers as I saw the data on this new cold world coming in," said Jackie Faherty, a senior scientist in the American Museum of Natural History's Department of Astrophysics and one of Backyard World's researchers. "It was a feel-good moment for science."

The Backyard Worlds project lets anyone with a computer and an internet connection flip through images taken by NASA's Wide Field Infrared Survey Explorer (WISE) spacecraft. If an object is close enough to Earth, it will appear to "jump" when multiple images taken of the same spot in the sky a few years apart are compared. The goal for Backyard Worlds volunteers—of which there are more than 37,000—is to flag the moving objects they see in these digital flipbooks for further investigation by the science team. So far, volunteers have classified more than 4 million flipbooks.

Days after the Backyard Worlds website debuted on February 15, Bob Fletcher, a science teacher in Tasmania, identified a very faint object moving across the WISE images. It was soon also flagged by three other citizen scientists from Russia, Serbia, and the United States. After some initial investigation by the research team, which originally called the

object "Bob's dwarf," Faherty was awarded time on NASA's Infrared Telescope Facility in Hawaii, where she confirmed that it was a previously unknown brown dwarf just a few hundred degrees warmer than Jupiter. The authors say that sky surveys had missed this object because it's too faint. All four volunteers are co-authors on the scientific paper announcing the discovery.

Brown dwarfs, sometimes called "failed stars," are spread throughout the Milky Way. They lack enough mass to sustain nuclear fusion but they are hot enough to glow in the infrared range of the light spectrum.

"Brown dwarfs are strikingly similar to Jupiter so we study their atmospheres in order to look at what weather on other worlds might look like," said Jonathan Gagné, a Backyard Worlds team member from the Carnegie Institution for Science.

Although the Backyard Worlds research team hopes to find the infamous Planet 9 hiding in our own solar system, these brown dwarfs are also exciting discoveries.

"It's possible that there is a cold world closer than what we believe to be the closest star to the Sun," Faherty said. "Given enough time, I think our volunteers are going help to complete the map of our solar neighborhood."

The Backyard Worlds project was developed by scientists at NASA, Arizona State University, the University of California Berkeley, the Space Telescope Science Institute in Baltimore, the science crowdsourcing site Zooniverse, and the American Museum of Natural History.

The Astrophysical Journal Letters paper: http://iopscience.iop.org/article/10.3847/2041-8213/aa7200/meta

AMERICAN MUSEUM OF NATURAL HISTORY (AMNH.ORG)

The American Museum of Natural History, founded in 1869, is one of the world's preeminent scientific, educational, and cultural institutions. The Museum encompasses 45 permanent exhibition halls, including the Rose Center for Earth and Space and the Hayden Planetarium, as well as galleries for temporary exhibitions. It is home to the Theodore Roosevelt Memorial, New York State's official memorial to its 33rd governor and the nation's 26th president, and a tribute to Roosevelt's enduring legacy of conservation. The Museum's five active research divisions and three cross-disciplinary centers support

approximately 200 scientists, whose work draws on a world-class permanent collection of more than 34 million specimens and artifacts, as well as specialized collections for frozen tissue and genomic and astrophysical data, and one of the largest natural history libraries in the world. Through its Richard Gilder Graduate School, it is the only American museum authorized to grant the Ph.D. degree and the Master of Arts in Teaching degree. Annual attendance has grown to approximately 5 million, and the Museum's exhibitions and Space Shows can be seen in venues on five continents. The Museum's website and collection of apps for mobile devices extend its collections, exhibitions, and educational programs to millions more beyond its walls. Visit amnh.org for more information.

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