

# Northwest citizen scientists among the many helping track solar eclipse across US

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At the instant the moon's shadow darkens the Oregon coast on the morning of Aug. 21, a scientific relay race will kick off with Bruce and Ryan Alder at the head of the pack.

From atop a peak in the Coast Range, the father and son from Corvallis will be the first in a transcontinental chain of amateur and professional astronomers to film the total solar eclipse on identical telescopes, from identical angles.

If all goes well, the result will be the longest video ever compiled of the planet's premier sky show, and a trove of data for scientists.

It's the "if" part that has Bruce, the elder Alder, on edge.

What if it's cloudy?

What if he screws up?

"We're stoked," he said. "And we're nervous."

Called Citizen CATE (Continental-America Telescope Eclipse), the project is one of more than a dozen scientific studies that will be crammed into the brief window of time when the [total solar eclipse](#) sweeps across the U.S. from coast to coast - the first such event in 99 years.

The main focus is on the corona - the faint, diaphanous atmosphere that surrounds the sun but is only visible during a [total eclipse](#). More than a hundred times hotter than the surface of the sun, the roiling halo is of keen interest to astronomers because it spits out immense clouds of supercharged plasma called coronal mass ejections. The clouds trigger Earth's colorful auroras, but can also disrupt power grids and communication networks.

NASA will track the eclipse with satellites that scan portions of the corona that won't be visible from the ground and measure jets of X-rays erupting from the sun. Teams of scientists will chase the eclipse in high-altitude jets equipped with instruments to measure the flux of light and energy. Researchers on a mountain in Wyoming will map magnetic fields in the corona, while others test new tools for probing the sun.

Eclipses have been the subject of scientific fascination for centuries, but the so-called "Great American Eclipse" is likely to be the most studied in history, says Thomas Zurbuchen, of NASA's Science Mission Directorate. With more than 200 million people living within a day's drive of the swath of totality and millions more tuning in online, it could also be the most watched.

Researchers are tapping into that enthusiasm to recruit legions of [citizen scientists](#) like the Alders to gather images and data along the eclipse's 2,500-mile-long path.

"The thing that excites me most is that people can walk out on their porch in their slippers and collect world-class data using modest instruments," said Matt Penn, an astronomer at the National Solar Observatory in Tucson, Ariz., and Citizen CATE's maestro.

He's assembled more than 200 volunteers and a few professionals who will be stationed at 68 locations from Oregon to South Carolina. All of

the groups will set up the same type of telescope equipped with the same type of camera. The scopes will be programmed to track and snap rapid-fire images of the eclipse throughout the roughly two minutes of totality at each spot. Then the images will be stitched together to create a 93-minute video.

Even though modern astronomers don't have to wait for an eclipse to study the corona, the natural sky show provides unique opportunities, Penn explained. Telescope attachments called coronagraphs can block the glare of the sun and reveal the corona, but they obscure the innermost layer - where a lot of mysteries remain.

Among them is the process that accelerates the solar wind, a stream of charged particles that roars off the corona at a million miles an hour. In order to better predict solar storms, scientists need to better understand the solar wind, Penn said.

The eclipse video will provide an unprecedented, time-lapse look at the way the inner corona morphs and moves. "No one has really looked at the corona in this way before, so there are bound to be new things that we discover," Penn said.

Volunteer David Anderson, of Bellevue, has been practicing in his backyard in preparation for the big day. A lifelong amateur astronomer who courted his wife on an eclipse-watching trip to Turkey, Anderson will be stationed at a state park near John Day in Eastern Oregon, where he will set up his gear long before dawn.

"They are relying on all of us to pull our weight," he said. "I take it very seriously."

The Alders plan to set up camp on their 2,500-foot-high mountain perch three days before the event - and keep their fingers crossed that coastal

scud won't obscure the view.

A pair of Seattle sisters are headed for Fort Laramie, Wyo., to take part in another coast-to-coast observing project using balloons.

Kimberly and Rebecca Yeung, ages 10 and 12, might be among the youngest citizen scientists studying the eclipse, but they aren't novices. Their experiments launching balloon-borne craft received wide coverage and earned the girls a trip to the White House Science Fair, where they met then-President Obama.

They call their enterprise Loki Lego Launcher, after their late cat, Loki, and the Lego figurines they fly on every mission.

On their own initiative, the girls hatched plans to launch a balloon during the eclipse. "We thought it was our original idea, and we were keeping it secret," Rebecca said. "Then we found out that NASA was doing it across the country."

Almost 500 students will help launch more than 100 high-altitude balloons as part of the Eclipse Ballooning Project, said organizer Jennifer Fowler from the University of Montana and Montana Space Grant. While most of the teams are middle-school age or older, she was thrilled to include the Yeung sisters.

"The fact that they came up with it on their own is brilliant," Fowler said.

The balloons will carry video cameras to film the moon's shadow racing across the continent and stream it live to NASA's website. Most will also carry small vials of bacteria to examine the effects on living cells of a trip to the stratosphere, while others collect data on shifts in temperature and cloud cover during the eclipse.

Each student team is also crafting individual experiments. The Yeung sisters will mount a small solar panel on their craft and monitor energy output as the sun dims and brightens.

Voting is open at the girls' website to pick the Lego figure that will make the trip skyward. The girls wanted a strong female character, so the candidates are pioneering pilot Amelia Earhart, Hermione Granger from the Harry Potter series, and Merida from the Disney movie "Brave."

So far, the real-life aviator is thrashing the fictional competition.

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## ECLIPSE CITIZEN SCIENCE

Some projects, like Citizen CATE and the Eclipse Ballooning Project, are filled. But others are open or DIY:

- How Cool is the Eclipse?

Collect air- and surface-temperature data on the GLOBE Observer App, even outside the path of totality.

- Eclipse Soundscapes

Use a mobile app to assist in this Harvard-Smithsonian project to record sound during the eclipse.

- Life Responds

Use the iNaturalist app to record animal and plant responses for the California Academy of Science

- HamSCI 2017 Solar Eclipse Experiment

Ham-radio operators can participate in a number of experiments to measure eclipse-triggered changes in the ionosphere.

- DIY Relativity Test

Uber-wonks can follow a published protocol to replicate the 1919 eclipse observations that validated Einstein's theory of relativity.

NASA; American Astronomical Society

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