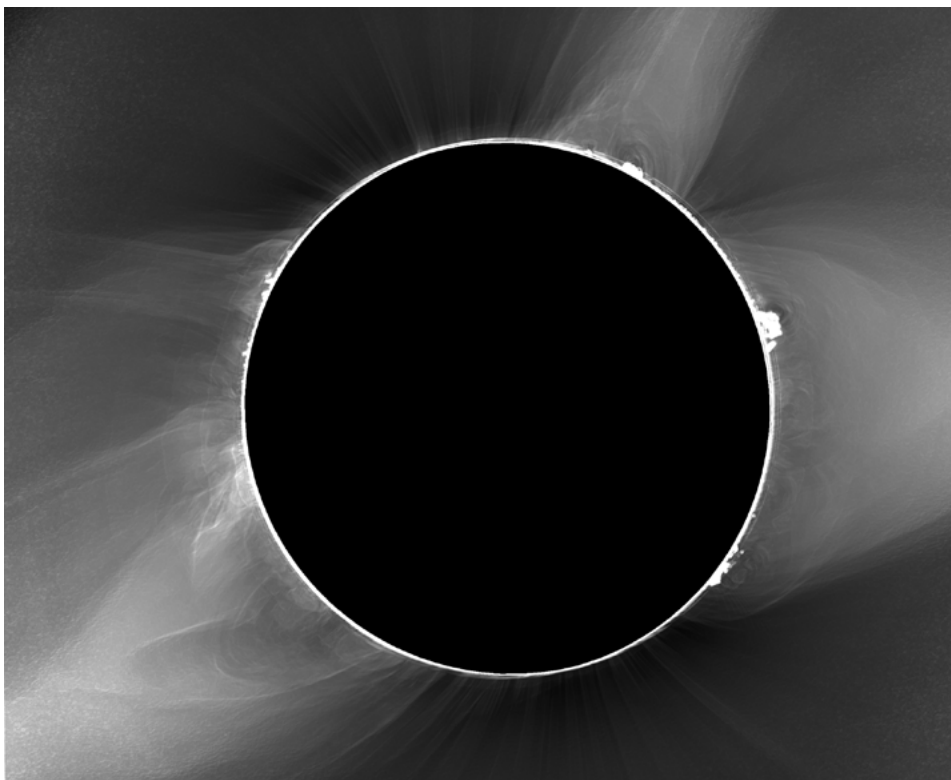


The DEB Initiative



High dynamic range image results from the 2017 Citizen CATE Experiment show fine details in the inner corona. The DEB Initiative's equipment will provide an even wider field of view.

By Matt Penn

The last two years have brought us four wonderful lunar eclipses. Now we enter a season of solar eclipses. There will be total and annular solar eclipses in both 2023 and 2024. With that in mind, who's ready for some eclipse science?

More than 215 million Americans watched the 2017 total solar eclipse. The highly successful 2017 Citizen CATE (Continental-America Telescopic Eclipse) Experiment organized and trained over 280 volunteers to operate 70 observing sites and capture 90 minutes of white-light images of the inner corona. The team published heliophysics science results on the acceleration of coronal mass materials and made data and software publicly avail-



Scan this QR code to visit the DEB Initiative website.

able, and in the years following the eclipse, the team published exoplanet observations and ran other projects using the telescope equipment.

Now a new citizen science eclipse project is underway. The DEB Initiative is led by Matt Penn, also the principal investigator and project lead for Citizen CATE in 2017. DEB stands for the **Dynamic Eclipse Broadcast**. The project will follow in the footsteps of the CATE Experiment while adding some ambitious new goals. We are hoping that some of you will join us.

The DEB Initiative will include observing sites inside and outside the path of totality in April 2024. Similar to 2017, observing sites will be evenly spaced along the path of totality. Teams within totality will gather data-quality images of the Sun's inner corona. Researchers will use this data to measure the velocity and acceleration of material in the inner corona, including any coronal mass ejections.

Observing teams outside the path of totality also play a key role in this research. They will monitor the Sun's surface, or photo-

sphere. Interactions between the photosphere and the inner corona are poorly understood. Simultaneous data from both the corona and the photosphere is vital when it comes to exploring how structures in the corona arise. With the 2024 total solar eclipse being close to solar maximum, there should be lots of activity to look at!

You might be wondering why we can't simply use images from other sites or space-based observatories such as the Solar Dynamics Observatory (SDO), Solar and Heliophysics Observatory (SOHO), or even the Parker Solar Probe. The SDO does not experience total solar eclipses because of its specific orbit. SOHO is only designed to observe the outer corona and Parker can only focus on small regions at a time. Also, as with any good science experiment, controlling variables is key. Having all observing sites using identical equipment greatly reduces the complexity of analyzing the data.

Yes, you read that right: you may be able to help us collect data that is not accessible by NASA satellites.

Citizen CATE involved 70 observing sites strictly inside the path of totality. Totality will last longer in 2024, requiring fewer sites along the path of the Moon's shadow. The goal is approximately 40 observing sites using updated equipment, evenly spread along the eclipse's path, and another 40-60 sites outside of totality, spread across the rest of the continent.

The DEB Initiative has already been working for two years to establish a new equipment



Matt Penn, seen here training Sienna High School students during the 2017 Citizen CATE Experiment, is also leading the DEB Initiative for 2023-2024. Many observing sites in 2017 were run by teachers and students.

package, which will be less expensive, faster, and better than the system used in 2017. It should function as an excellent introductory setup for new astronomy enthusiasts, and it will be an excellent guide scope upgrade for veteran astro-imagers. There are plans to test this package in Australia during the April 20, 2023, total solar eclipse.

The annular solar eclipse on October 14, 2023, in the United States will be the first large-scale test for the DEB Initiative. While there is not as much solar science to accomplish during an annular eclipse, the team will examine the ability to measure structures along the lunar limb using parallax, made possible by widely separated observers. It will also be a wonderful opportunity for

public education and outreach.

All of this adds up to great science and an enjoyable experience for those involved, but you may notice that none of it explains the project's name. This will be a Dynamic Eclipse Broadcast, meaning that images from all the observing sites will be broadcast live during the eclipses this October and in April 2024. Images from each site will be loaded onto a map once each minute. Anyone will be able to use the DEB Initiative's website to see the eclipse in progress at all observing sites simultaneously.

This is a citizen science project, so we hope a number of you will join us. The DEB Initiative is looking for both participants and financial contributions. Many members of the

CATE Experiment in 2017 were high school and college teachers working with their students, and we hope that will be the case again in 2023 and 2024. Many astronomy clubs are active in astronomy outreach and lament how few young people are active in their clubs.

We hope you will consider sponsoring a site or partnering with a local school. You will be trained on how to use the equipment and there will be follow-up projects involving solar, exoplanet, asteroid, and variable star observations, giving everyone the ability to continue to participate in citizen science after 2024.

If you are interested in learning more or signing up as a participant, visit *DEB Initiative.org* for details or contact Matt Penn at *debinitiative@gmail.com*. ★

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