

Elizabeth's Guide to Watching a Solar Eclipse

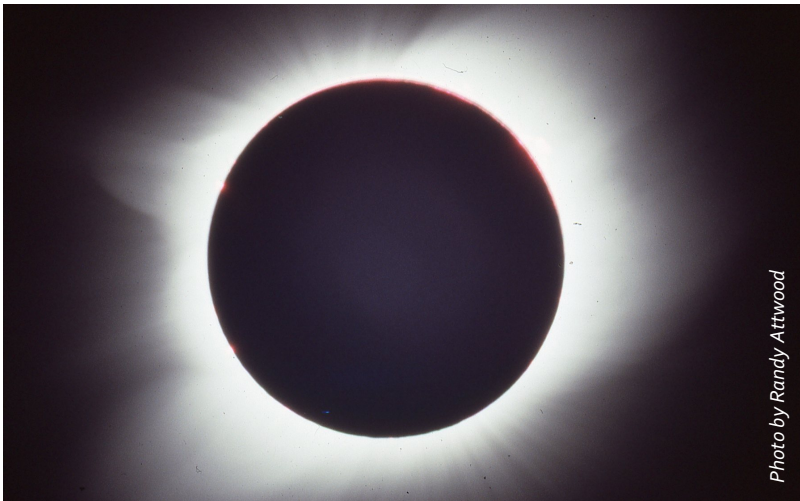


Photo by Randy Attwood



Photo by Randy Attwood

Inside...

- Elizabeth's Eclipse Checklists
- Make Your Own Pinhole Eclipse Viewer
- Measure Temperature Changes During a Solar Eclipse
- Challenge Activity: Shadow Bands
- Be a Citizen Scientist

Welcome!

Welcome to *Elizabeth's Guide to Watching a Solar Eclipse!*

This guide is a supplement to *Elizabeth's First Total Solar Eclipse*, which is the third book in my Elizabeth series.

While the book was written in anticipation of the solar eclipse on April 8, 2024, most of the information is relevant for any total solar eclipse, just like the information in this guide.

In this guide you will find helpful checklists to prepare for a total solar eclipse, as well as templates to make your own eclipse viewer out of cardboard. There is also information about collecting data during an eclipse and participating in Citizen Science programs.

Not included in this guide is information about photographing the eclipse. If you are seeing an eclipse for the first time, just watch it and enjoy the spectacle. Taking a few seconds to record temperature readings shouldn't be too much of a distraction, but it certainly is not necessary, and taking a minute to make a quick sketch can help you notice more details.

Learning to photograph the Moon, sky, and eclipses takes patience, practice, and a long time! There are many websites, books, and groups to help you get started.

I would love to hear about your eclipse experiences, for any eclipse. Feel free to contact me at elizabethbookseries@gmail.com.

Good luck!

Betty R.

Elizabeth's Eclipse Checklists

Several months or even a year before the eclipse:

- Know where you are going to see the eclipse. This will mean researching the spot that is right for you, with the best weather prospects (see below). Obtain any permissions in case you are on someone's property. Make sure that washroom facilities are available or nearby.
- Get your eclipse glasses! These sell out quickly, so order them as soon as you can! ([Royal Astronomical Society of Canada](#), [The Monarch Butterfly Eclipse Project](#), [Rainbow Symphony](#))
- Know when the eclipse starts and ends for your location (<https://www.timeanddate.com/eclipse/>). You can check your app store for eclipse apps that will give you accurate information. Some examples are Solar Eclipse by Redshift, Total Solar Eclipse, and Solar Eclipse Timer.
- Know the weather prospects. (<https://eclipsophile.com/2024tse/>; <https://www.almanac.com/weather/longrange/ON/Toronto>)
- Learn what types of animals may be at your eclipse site, so you can check for animal reactions during totality.

Several weeks before the eclipse:

- Learn what planets and bright stars to look for during totality, as well as their positions. (For April 8, 2024: <https://theskylive.com/solar-eclipse?id=2024-04-08>)
- Find out if you will be able to see the International Space Station during the eclipse. ([Heavens Above](#))
- Design and make an eclipse T-shirt!
- Do some tests with your thermometer if you are using one.

A couple days before the eclipse:

- Assemble everything!

See the next two pages for checklists you can use.

✓	Eclipse Checklist 1: What to Bring on Eclipse Day
	eclipse glasses
	appropriate clothing for the weather (perhaps an extra sweater because during totality it gets cooler, and hat and gloves, if necessary)
	sunscreen
	food, water
	a portable, collapsible chair
	your eclipse T-shirt if you have one
	for sketching: a few pencils and pens, an eraser, a pencil sharpener, paper and/or a sketchbook, and a clipboard to hold Eclipse Checklist 2: When Observing the Eclipse and any paper for drawing
	a pinhole viewer, such as a colander from home or a viewer you made yourself (see Make Your Own Pinhole Eclipse Viewer)
	a white pillowcase or a sheet of white paper to look for shadow bands; you may need to look for small stones to hold the pillowcase or paper in place on the ground (see Challenge Activity: Shadow Bands)
	a thermometer if you plan to record temperature differences (see Measure Temperature Changes During an Eclipse)
	camera equipment if you plan to take photos
	a smartphone, tape recorder, or video recorder to record the sounds and sights during the eclipse
	a tripod to hold the recording device
	if you aren't using an eclipse app, bring an accurate timing device, such as a digital watch or smartphone
	a star chart or planisphere if you plan to look for certain stars
	any pages of this guide you'd like to use
	a compass to make sure you know which way is west so you can watch the Moon's shadow approach

Eclipse Checklist 2: When Observing the Eclipse	
After you have set up your tripod, timing device, and pillowcase:	<ul style="list-style-type: none"> • Observe your surroundings: Are there clouds? Are there any animals? Where are they? What are they doing? • If the eclipse has started, put on your eclipse glasses and watch the partial phases; remove them to observe your surroundings but always put them back on to observe the partial phases. • As the eclipse progresses, use your eclipse viewer to see the partial phases on a pillowcase on the ground, on a wall, or on the side of a building.
Start your temperature recordings:	<ul style="list-style-type: none"> • At about an hour before totality, start taking temperature readings of the air about every 10 minutes. Then, around 10 minutes before totality, take more frequent temperature readings. Be sure to record the temperature during totality, and then again about an hour after totality has ended.
About 2 to 3 minutes before totality:	<ul style="list-style-type: none"> • Look west to watch the Moon's shadow coming toward the eclipse site. • Look for sunset colours and notice how the light levels are changing. • Look at the pillowcase or sheet of white paper on the ground to check for shadow bands.
Just before totality:	<ul style="list-style-type: none"> • Remove your eclipse glasses. • Watch for the diamond ring.
During totality:	<ul style="list-style-type: none"> • Enjoy the sight! • Look at the corona. (The corona is the outer atmosphere of the Sun. It's the white glowing area you see during totality.) Sketch the total eclipse if you can or sketch it after totality. • Remember to take a temperature reading at the start of totality. • Look for planets and bright stars; add them to your sketch. • Look for the Big Dipper and any other stars. • Look for the International Space Station, if it's visible at that time. • Be aware of the people around you and their reactions. • Observe and record the behaviour of any animals and birds.
Just after totality:	<ul style="list-style-type: none"> • Watch for the diamond ring on the other side of the Moon. • Look for shadow bands again. • Take another temperature reading. • Observe and record the animal behaviour.
During the final partial phases:	<ul style="list-style-type: none"> • Continue to take temperature readings. • Continue making sketches of the eclipse to the end if you want.

You can use this page to record your own drawing of the eclipse. There is also a table on the next page you can use to note any animal and bird observations.

My Drawing of the Eclipse

Date: _____ **Time:** _____

Location: _____

Animal Behaviour

What animals and birds are there?

What are they doing before the eclipse?

During the eclipse?

After the eclipse?

Make Your Own Pinhole Eclipse Viewer

Before the Moon completely covers the Sun, there is too much sunlight for us to safely observe the eclipse. These times are called the partial phases, and we can watch them using eclipse glasses. But if you don't have a pair, you can watch the partial phases by projecting the image of the partial eclipse onto another surface, like Elizabeth did with the colander in *Elizabeth's First Total Solar Eclipse*, or you can make your own viewer.

To make an eclipse viewer, take a piece of cardboard, such as from a cereal box, and poke holes in it. Ask for help if you need it to poke the holes. Then, with your back to the Sun, hold out the viewer so that you can see the partial eclipse on the ground or another surface.

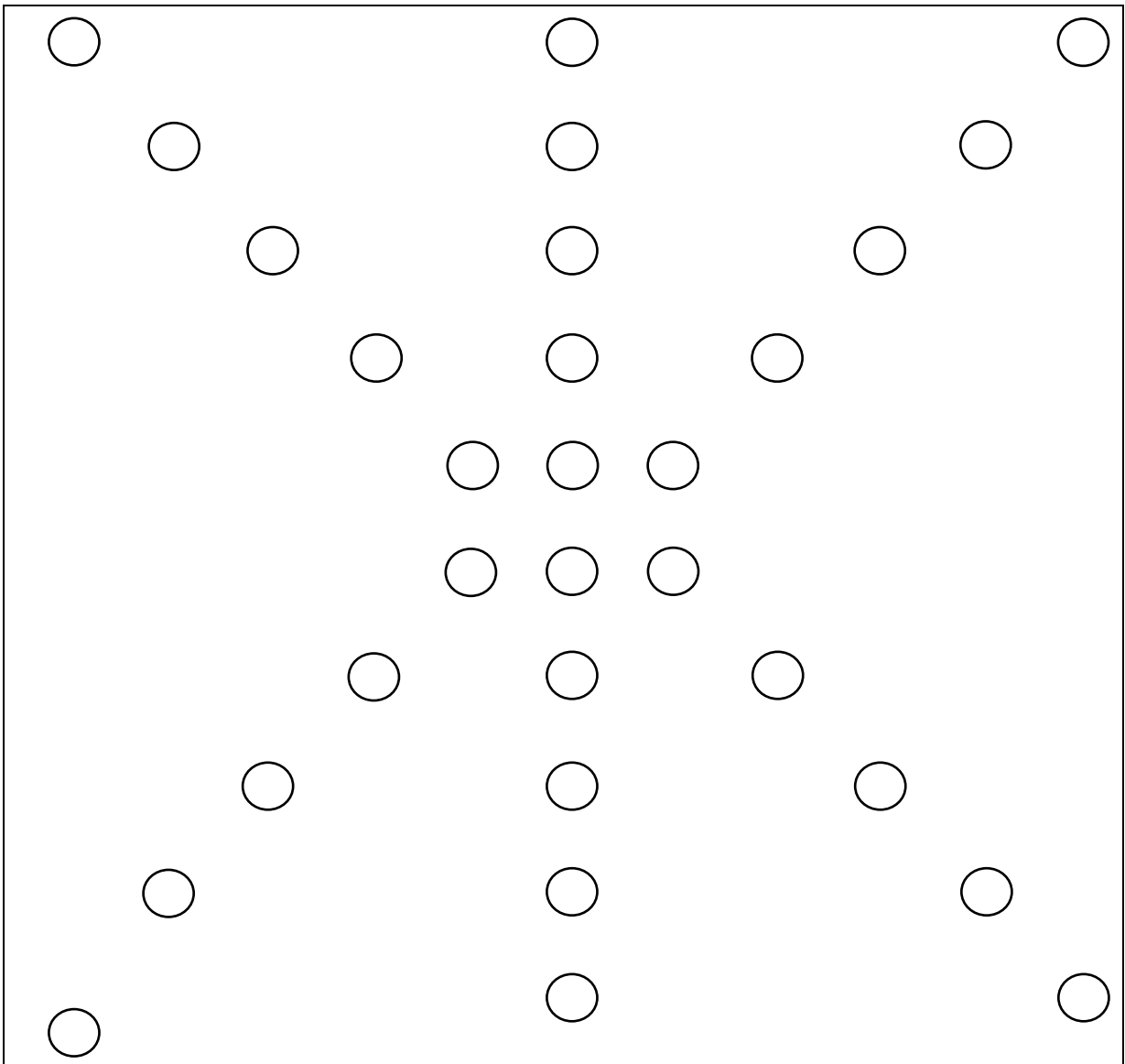


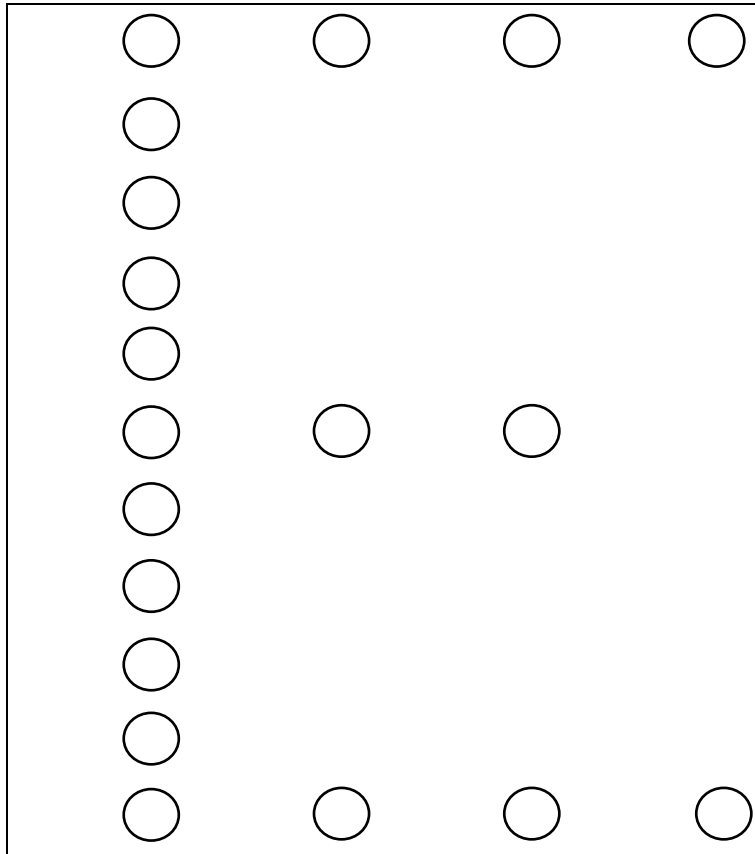
If there are leafy trees nearby, check the ground for images of the eclipse through the leaves. Photo by Betty R. Robinson



*You can even just use your hands!
Photo by Randy Attwood*

Here are some templates you can use, but you can also be creative and make your own design. Print the page. Then poke holes for the circles. The holes don't have to be very big, about the size of the holes in a kitchen colander, between 2 mm and 5 mm. Don't try to use your eclipse viewer during totality, though. There won't be enough sunlight because the Moon will be completely covering the Sun!





Measuring Temperature Changes During a Solar Eclipse

An interesting science activity to do during a solar eclipse is to take temperature readings. Sometimes, the change in temperature can be dramatic, and it can get quite cool during totality. Be sure to use an easy-to-read digital thermometer, and practise before eclipse day to make sure you understand how quickly your thermometer reacts to changes in air temperature.

A word of advice about taking temperature readings: don't rely on a smartphone. Often smartphones pull their temperature readings from a main database and not from the current location.

Start taking air temperature readings. Refer to **Eclipse Checklist 2: When Observing the Eclipse** for suggestions. You can use the table on the next page to record your readings if you want.



*Use whatever thermometer you can.
Digital is the most accurate, though.*

Challenge Activity: Shadow Bands

What Are Shadow Bands?

If you want a challenge, look for shadow bands. Shadow bands are bands of sunlight that ripple across the ground and other surfaces during a total solar eclipse. They look like ripples of light you sometimes see at the bottom of a swimming pool.

Shadow bands are caused by refraction. Just before the Moon almost completely covers the Sun during a total solar eclipse, the narrow bit of remaining sunlight comes through Earth's atmosphere and is refracted. The sunlight reaches the ground and looks like thin, moving shadows. The atmosphere has different pockets of air, and the pockets are always changing, so the refraction of the sunlight through the pockets is always changing.

Shadow bands happen twice: just before the Moon covers up the last bit of the Sun, and just as the first bit of sunlight appears after the Moon finishes eclipsing the Sun.

Try to See Shadow Bands

Because shadow bands are usually really faint, they are difficult to see. So, place a white pillowcase or other piece of white or light-coloured material on the ground. You can put some stones or rocks on the corners to hold it in place.

Then, about two minutes before totality, start checking the white material for shadow bands. If you see them, try to describe them: Are they moving at the same speed? Are the bands all the same width? When did you see them? Are they obvious? What direction are they moving?



This illustration shows shadow bands on a house from an eclipse in 1870.

Be a Citizen Scientist

What Is a Citizen Scientist?

A citizen scientist is an amateur scientist—someone like us—who makes scientific observations.

During a solar eclipse, there are different observations you can make, just like Elizabeth did in *Elizabeth's First Total Solar Eclipse*. For example, you can take temperature readings at your site before, during, and after the eclipse. Or you can document the reactions of any animals at your eclipse site. You can also observe the Sun before and during the eclipse.

There are more involved and advanced observations you can make, too. For example, you can learn how radio signals in the upper atmosphere are affected during an eclipse.

Before the eclipse, though, you will need to visit the various citizen science websites to see what data different organizations are looking for and how to participate.

Websites

Here are some websites for citizen scientist activities:

Eclipse Soundscapes: If you are interested in the reactions of animals, birds, and insects during a solar eclipse, be sure to check out NASA's [The Eclipse Soundscapes: Citizen Science Project \(ES:CSP\)](#). You can be part of this project by collecting observations and sounds that happen during an eclipse. But you must be at least 14 years old, so you may need an adult to work with you.

Solar Observing: Get training in solar observation and be part of a North American group to collect data on the Sun before and during the eclipse. You can get more information at the [Dynamic Eclipse Broadcast Initiative](#) site. You have to be at least 11 years old, so get someone to help if necessary!

Festivals of Eclipse Ionospheric Science: Do you know someone who operates a ham radio? [The Ham Radio Science Citizen's Investigation](#) will be collecting data about radio signals throughout the eclipse, to learn more about the ionosphere. The ionosphere is a high-altitude part of our atmosphere, with lots of charged particles (ions). This project is for 11- to 17-year olds.

Record Temperatures and Cloud Features Through a NASA app: There is a free NASA app called Global Observer. During solar eclipses, the Global Observer Eclipse tool becomes available. With this temporary tool, you can record data such as air temperature as well as document features such as clouds. Learn more about how to be part of this project through the [Global Observer Eclipse](#) website. There is no age restriction for this activity.

The Eclipse Megamovie Project: You can send your photos of the corona to be part of a huge collection of photos taken during the April 2024 eclipse. Once all the photos have been assembled, they will be run through an artificial intelligence program that will identify plasma plumes and see how the corona changes over time. For more information, including signing up for the project visit [The Eclipse Megamovie Project](#) website.