



ECLIPSE WATCH

A COLLECTION OF ARTICLES FROM THE RAS BULLETIN ON THE 2024 ECLIPSE

2024 Eclipse Watch

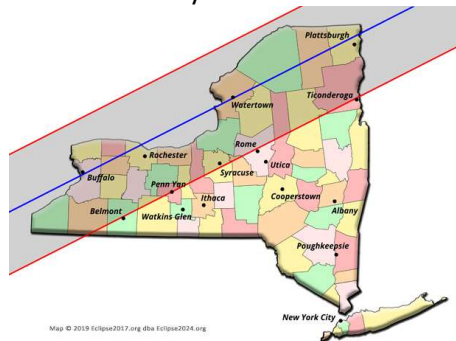
By Michael Grenier

On March 1st, 2024, it will be just **37** days until the total solar eclipse passes through Rochester on Monday, April 8, 2024. The partial eclipse as viewed from Rochester, NY is calculated to begin at 2:06 PM with totality starting at 3:20 PM and lasting 3 minutes and 40 seconds

<https://www.greatamericaneclipse.com>). If you go to all the way to Eagle Pass, TX, you only get an extra 43 seconds of totality. Will it be worth the trip? You'll have to ask the visitors that make their way there. Cape Girardeau, MO only gets 26 seconds more than Rochester. Keep a close eye on weather forecasts as the date gets closer and pray for clear skies in New York! *August-September 2022*

Eclipse2024.org has a page that gives information on 75 possible viewing locations on the path of totality in the U.S. See https://eclipse2024.org/eclipse_cities/blog-posts/eclipse-viewing-information-for-locations-all-along-the-path.php.

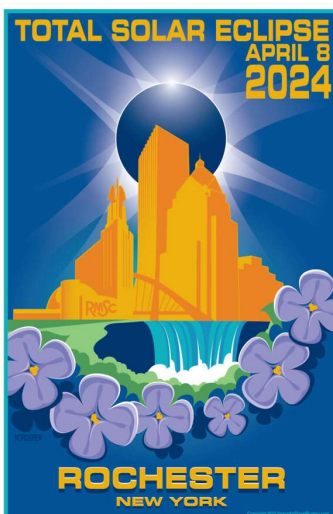
So what do they show for Rochester?



Most of western NY is in the band of totality (grey on the above map. They also have a more detailed map showing that the center of totality (blue line) with the longest viewing

time (fractions of a second extra) passes through Corfu, Elba, Brockport, and Hilton. Braddock Bay might be a great viewing spot! *October 2022*

Rochester has its own **Eclipse Task Force**.



Official poster of the Rochester Eclipse Task Force by Tyler Nordgren

RMSC has optioned up to half a million eclipse glasses. Expectations by the task force are that 350-500,000 people will come to Rochester for this event. *December 2022*



Eclipse Glasses

The **ONLY** safe way to look directly at the Sun is through special-purpose solar filters, such as "eclipse glasses" or handheld specially-made solar viewers. *Any other device you have heard of is hare-brained and will damage your eyes!*

To ensure that we in the Academy have enough glasses, we have arranged to acquire 15,000 pairs of

glasses. Every member will get enough for the family and friends in their viewing party and may get more for doing outreach with the public wherever they might plan to be going to view the eclipse. *June 2023*

NASA warns that when watching the partial phases of the solar eclipse directly with your eyes, which happens before and after totality, you must look through safe solar viewing glasses ("eclipse glasses") or a safe handheld solar viewer at ALL times. <https://solarsystem.nasa.gov/eclipses/2024/apr-8-total/safety/>

Eclipse glasses are NOT regular sunglasses; regular sunglasses, no matter how dark, are not safe for viewing the Sun. Safe solar viewers are thousands of times darker and must comply with the ISO 12312-2 international standard.



You can wear eclipse glasses to safely view the Sun during the partial eclipse phases of a solar eclipse, before and after totality. Credits: NASA/Mamta Patel Nagaraja

These must filter out 100% of harmful ultra-violet, 100% of harmful infrared, and 99.999% of intense visible light, making it safe for direct solar viewing. This is 31,000 times darker than ordinary sunglasses. Variable shade welding goggles are NOT safe for solar

viewing, but those rated 12 or 13 are useable (14 might be too dark).

Viewing any part of the bright Sun through a camera lens, binoculars, or a telescope without a special-purpose solar filter secured over the front of the optics will instantly cause severe eye injury. You cannot combine these with eclipse glasses.

These devices require different types of special solar filters. Eclipse glasses will be available from RAS. More details on this in future issue of the *Bulletin* and ASRAS's *The Rochester Astronomer*. Make certain you have the right equipment for eclipse viewing. *July 2023*

The 2024 Total Solar Eclipse passes through Rochester on Monday, April 8th.

You'll be able to find viewing events all over the region that day. Large parks with open fields are good choices. You might also consider the Rochester Museum & Science Center (RMSC) which will have planetarium shows, concerts, and other activities in a 3-day festival. With up to 350,000 visitors to the area, get an early start as traffic will be heavy. Remember, you will be looking at the sun and you **MUST wear eclipse glasses in order to look at the eclipse that day.**

The last U.S.-visible total solar eclipse of August 21, 2017 appeared here only as a partial eclipse with about 70% of the Sun covered. You might have seen that. Most folks in the U.S. outside the path of totality next year will still be able to see a partial solar eclipse.

The last total eclipse in Western NY was over 98 years ago, way back on [Jan. 24, 1925](#). The next one will not be until July 23, 2093—over 71 years from now. The next Annular Solar Eclipse of July 2, 2057 will be only a partial eclipse with 77% coverage in Rochester. That's a dimming, not a darkening.

What will you see during the 2024 Total Eclipse?

Be early at your desired location to beat the crowd, find parking, and secure your spot. There will be plenty to do with talking to other folks about the eclipse, especially if you have read all about it and are the most knowledgeable person in your vicinity.

This will be my second total eclipse, as I saw the August 21, 2017 total eclipse at Cape Girardeau, Missouri. Much of what follows is based on my personal experience. *This total solar eclipse may be a life-changing experience for you.*

Make sure you have enough special-purpose "eclipse glasses" for your entire party. These are available from the RMSC store. *Remember, the ONLY safe way to look directly at a solar eclipse is through such special-purpose solar filters.* Bring extra viewing glasses to pass around to locals in your vicinity, making people share, so you don't feel bad about not sharing your own with those who didn't know enough to get their own. This will make you a special person at this event.

Because of the Sun's brightness you are unlikely to see the moon in the same part of the sky, but it is there. The moon will be lower and to the right of the sun. By 1PM the sun will be at about its highest, as it is really noon, except we are on daylight savings time. As the sun seems to move to the west (remember that it is the earth spinning and not the sun moving), the moon is moving east and will close the distance with the sun.

At about 2:06PM, the eclipse begins as the leading edge of the moon aligns with the edge of the sun. The Moon has likely been invisible in the daytime sky, but now you can start to see it as a black disk blocking the Sun. It will still be broad daylight, but it will begin dimming, like a sunset that takes over an hour. This will be a partial eclipse until 3:20PM when it becomes total.



Eclipse phases. Credit: Michael Zelier. Photo source: [GreatAmericanEclipse.com](#)

The photo above of the total solar eclipse of April 20, 2023 was taken by Michael Zelier at Exmouth Bay, Australia. The moon entered from the upper left (it's a southern hemisphere thing), but read it from lower right to the left to be more like what you'll see here. (My source is [Exploratorium.edu](#) which reports that the Moon will be "approaching it [the Sun] from the right as seen from the Northern Hemisphere.") The angle of motion will be somewhat different for next year's eclipse. The bottom row shows the partial phases before totality. These partial phases will last about 1¼ hours. The middle row shows the 3 minutes 40 seconds of totality you'll see from the first diamond ring to the second. (The 2023 eclipse only lasted a minute at Exmouth Bay.) The top row shows the partial phases after totality, which again will last about 1¼ hours.

As more of the Sun is eclipsed and daylight starts to fade, watch for strange lighting effects. Not only will you see shadows, but they will be much sharper than usual as the light source narrows. As it reaches near totality, look for shadow bands—undulating shadows on plain surfaces.

The band of totality as shown on eclipse maps is the Moon's shadow. This moves at about 1875 mph (the Moon's speed adjusted by the Earth's rotation speed adjusted by latitude). If you have a clear view of the ground to the southwest, you may see the moon's shadow speeding toward you as totality comes.

As twilight comes on, stars and planets will appear. The stars are the winter sky you normally see in February. You'll have a few minutes before totality so you can look for the easy-to-find Orion constellation and look for bright Venus to the Sun's bottom-right and Jupiter to the upper-left. Make it quick and don't miss the main show. You might also see an orange sunset-like glow at the horizon all around.

As we lose the Sun's rays, you'll sense the drop in temperature of up to 10 degrees Fahrenheit. Now listen closely. This is eerie. The insects and animals don't know it's an eclipse and they think it is sunset, so you will hear all the nocturnal bird and insect noises coming on very oddly for the middle of the day and the ceasing of normal daytime noise. (The people around you may start behaving oddly as well.)

The Moon is not perfectly round. It has a raggedy edge due to craters, mountains, and valleys. Sunlight will shine through low points.



Baily's Beads. Credit: Robert B. Slobins, <https://eclipse.aas.org>

Moments before totality (and again after), you will see what looks like a string of beads around the Moon. These are called "Baily's beads" after Francis Baily described the phenomenon to the Royal Astronomical Society in December 1836. They should be "Halley's Beads" because Sir Edmond Halley made the first observations to be published after the 3 May 1715 solar eclipse. (*Philosophical Transactions*, Vol. 29 (1714 - 1716), pp. 245-262).

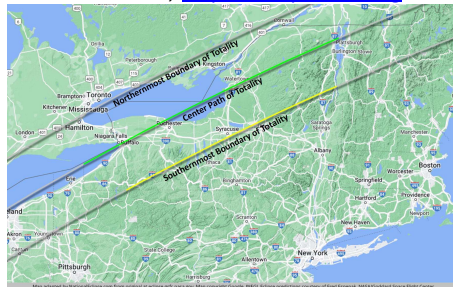


"Diamond ring." Credit: Rick Fienberg / TravelQuest International / Wilderness Travel, <https://eclipse.aas.org>

As the Moon fully covers the Sun, the beads will disappear until only one remains, looking like a diamond ring as the Sun shines through a deep lunar valley. Momentarily, you may see the Sun's middle atmosphere—the chromosphere—as a red arc along the Moon's edge, and maybe red plasma prominences above the surface.



Chromosphere and prominences. Credit: Robert B. Slobins, <https://eclipse.aas.org>



Take off your eclipse glasses if you like. It is now safe to view the Sun with your unaided eye. This is totality.

The corona emerges. This is the Sun's outer atmosphere. The only time you can ever see the corona with the unaided eye is during a total solar eclipse. The corona is much hotter than the Sun's surface. Enjoy the view and everything going on around it.

The show is half over.

All of the preceding events will occur again in reverse order, beginning with the chromosphere and prominences reappearance, followed by the diamond ring and Baily's beads. **Quick!** If you took off your eclipse glasses, put them back on. Enjoy the rest of the show.

It doesn't end until 4:33PM.

For more, see planetary.org/articles/eclipse-2024-checklist and <https://www.exploratorium.edu/eclipse/what-to-see-during-eclipse>.

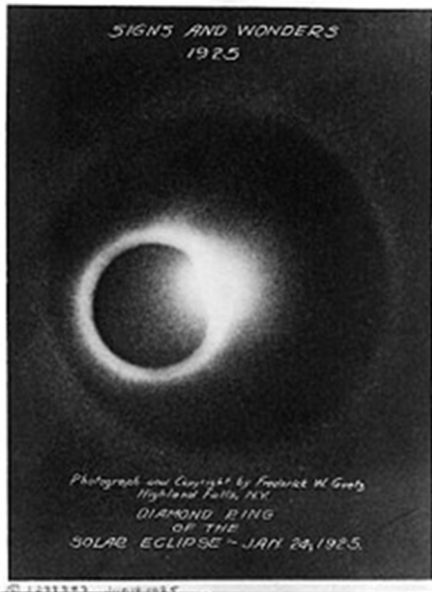
October 2023

You may have decided that travel to another location is not feasible and that you'll try to catch it in Rochester. We all know that Rochester is one of the cloudiest cities in America. One site rates Rochester #8 on its cloudiest list, with an average of 208 days a year when cloud covers more than three-quarters of the sky. That's a 55% chance of cloudiness. So, you'll be watching the forecast and if overcast is forecast, what can you do? You need a Plan "B." Fortunately, the swath of totality—see map below—covers a good part of western NY. Unfortunately, you cannot improve your odds by a lot by driving. You should probably forget about Buffalo, Syracuse, or Batavia. They average 208, 205, and 202 cloudy days a year respectively—but check their forecasts also. Heading south might be a better bet—our ASRAS observatory in Ionia is often clear when Rochester is cloudy. Corning has only 195 cloudy days on average

and Mansfield, PA only 185, a bit better than a 50/50 chance. *All-in-all, you better hope for good luck to us all.* February 2023

The last total eclipse in Western NY was over 98 years ago, way back on [Jan. 24, 1925](#). The next one will not be until July 23, 2093—over 71 years from now. The next Annular Solar Eclipse of July 2, 2057 will be only a partial eclipse with 77% coverage in Rochester. That's a dimming, not a darkening.

I hope this gives you a sense of how extraordinarily rare a total eclipse is here. In this 169-year interval, next year has the only one.

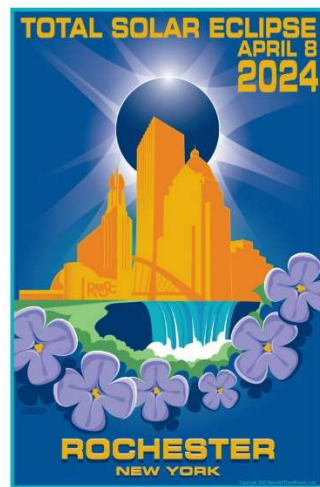
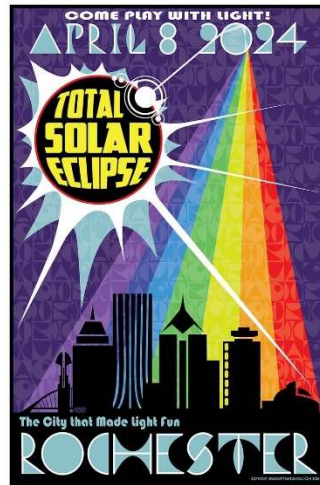


We are fortunate to have a photograph of the last one. (Credit: Library of Congress)

The Syracuse Herald reported the next day on January 25, 1925 that thousands of people in Syracuse and Central New York viewed the "phenomenon of the century" and pronounced it "impressive, awesome, magnificent and inspiring." Their team of reporters wrote that they saw the "flaming corona - masses of blazing fire shooting from the rim of the black spot in the sky." Viewing conditions were fairly good. Peak totality occurred at 9:11 a.m. and lasted two minutes. It was cold, with temperatures near zero, and with clouds occasionally obscuring parts of

the eclipse. Most business was suspended as folks went out-of-doors for "the sight of a lifetime." Viewing in Rochester was also good. They were fortunate, as Buffalo and Niagara Falls were overcast, seeing none of the eclipse, only a darkening. March 2023

Traveling Eclipse Art Exhibit



In November, I touted the traveling eclipse poster art exhibit, *The Art of the Eclipse: Works by Tyler Nordgren*. It has just finished its exhibition at the SUNY Brockport Tower Fine Arts Gallery & Rainbow Gallery on February 25th and will now be at the Rochester Museum and Science Center through to eclipse day, April 8th. I recommend seeing this 30-poster exhibit, consisting of eclipse posters from 2017 and 2024, as well as Dr. Nordgren's New York Parks series. I visited the exhibit when it was at the Webster Parks & Recreation building

in December. Rochester, of course, has two posters by Tyler. My favorite is his international poster which captures the feeling of pure joy—rapture even—that many eclipse viewers will feel.



Other local posters include works for Buffalo, Niagara Falls, and the Finger Lakes region. There are many others besides.





The Rochester Museum & Science Center (RMSC) plans to be at the heart of Rochester's Total Solar Eclipse efforts. They are celebrating with a 3-day festival—*ROC The Eclipse*—filled with hands-on activities, speakers,

music, food, planetarium shows, artwork, and more! They expect several thousand guests each day of the festival. They're working towards making sure the eclipse is accessible and exciting to literally everyone under the sun. If you are not at the big ASRAS Eclipse Party at the Ionia Observatory, you could choose well in being at the RMSC.

New Video

RAS member Devon Dice-Jaffri has produced an educational video especially for Upstate New York audiences. It is targeted to schools and community organizations. Devon is active with our Astronomy Section and is a NASA Solar Eclipse Ambassador Partner. The video is 6 minutes 45 seconds long and can be seen at <https://youtube.com/watch?v=eHSqIGd3PUY&feature=shared>.



She interviews several experts including astronomer Holly Cohen at the Buffalo Museum of Science, President Michael Humphrey of the Buffalo Astronomical Association, Director Mark Percy of the Williamsville Space Lab Planetarium, and meteorologist Don Paul with weather advice. *November 2023*

I noted last month that one unusual spectacle to watch for is the moon's shadow speeding across the earth's surface.

Yes, I'm bein' followed by a moonshadow, Moonshadow, moonshadow. – Cat Stevens

There is an interesting simulation of the moon's shadow moving from Sinaloa Mexico, where it comes in from the Pacific Ocean, to Eagle Pass, TX, where it crosses the US border, and the across the United States. If

you start it at 2:15, you can follow it from western Ohio as it approaches Buffalo and Rochester. <https://www.greatamericaneclipse.com/april-8-2024>. For each locality on the center line, it gives the time of totality, duration of totality, speed of the Moon's shadow across the earth's surface, and the width of the path of totality. For Buffalo, totality starts at 3:18PM and lasts 3 minutes and 45 seconds. The moon's shadow is speeding at 2,254 MPH and the width of the shadow is 111.1 miles. For Rochester, totality starts at 3:20PM and lasts 3 minutes and 40 seconds. The moon's shadow is speeding at 2,315 MPH and the width of the shadow is 110.6 miles.

On another note, people have asked if they can reuse their eclipse glasses left over from previous events. The American Astronomical Society says modern eclipse glasses do not expire. If the glasses were compliant with the ISO 12312-2 standards (in effect from 2015 on) and have no punctures, scratches or tears, they should be fine as long as the filters/lenses remain attached to the frames. In other words, if you stored them carefully, you can use them again. On the other hand, glasses are so cheap and eyes so valuable, that I will be using new glasses even though I still have mine from 2017.

You should keep in mind to buy your glasses from a valid source. Rainbow Symphony and American Paper Optics are the two main manufacturers, close to the astronomy community, and those are tested and approved by the American Astronomical Society. Note that many of the glasses sold on Amazon were found by the AAS to be counterfeit, although most tested ok. If you get your glasses from RAS/ASRAS or the RMSC, you will have the good ones.

December 2023 - January 2024

Rochester was named best place to view the eclipse at a museum by National Geographic. Eclipse glasses may be in short supply, so get yours early. The RMSC has ordered 500,000 eclipse glasses. 15,000 come to RMSC. get yours soon. The Rochester NY metro area has over a million people, we are expecting 350,000 visitors, and people in surrounding counties will be drawing on those also.

Of course you can get eclipse beer for your eclipse party!



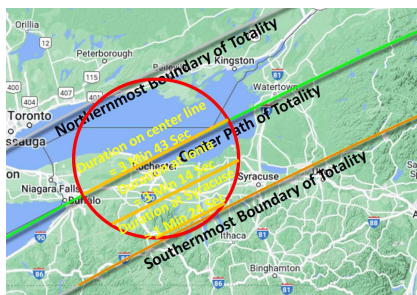
This collection is a collaboration of three local breweries. Strangebird Brewery will produce a barrel-lagered Helles called THE LIGHTER SIDE, Rohrbach Brewing Company will produce TOTALITY, a black lager; Three Heads Brewing will produce THE DARKER SIDE, a Steam style lager. Production dates not yet announced.

Many members will be at our own ASRAS Marian and Max Farash Center for Observational Astronomy in Ionia to view this event. Reservations are required. One advantage is that there'll be many friends and experts on hand. However, parking space is limited, and you may have to park on County Road 14. The Rochester Museum & Science Center (RMSC) expects to be crowded during the eclipse. They will have a full slate of activities all day long as well as on Saturday and Sunday, including planetarium shows, solar telescope viewing, live stage entertainment. At the RMSC, the Eclipse begins at

2:07pm, totality is from 3:20 to 3:23pm (lasting 3 minutes and 38 seconds), and it ends at 4:33pm. My plan is to take my guests to RMSC over the weekend and then to Farash Observatory or Braddocks Bay area for Eclipse Day, depending on forecast.

The RMSC is not at the center line of totality. If you are on the center line, you get five more seconds of totality. For this, you want places like Hilton, Clarkson, and Clarendon. If you are at the Farash Center, you get 24 seconds less totality than at RMSC. A few seconds won't matter much, though, and is worth it to be with friends and experts.

How does this work? On the Earth's surface, the moon's umbral shadow is a circle of darkness roughly **269 km (167 mi)** in diameter. If you are on the center line, the full diameter of the shadow passes over you. If you are near the edge, the time is shorter.



Above, the red circle is the area of the moon's shadow and total eclipse at 3:22PM (two minutes and halfway into the totality of eclipse phase). The upper orange line is the center path, the middle is at Ionia, and the bottom is for Syracuse (It gets only 38% of the time you'll get at Ionia.) The shadow moves at the same speed everywhere, so the distance proportions are the same as time.

The local tourist bureaus and governments are expecting 300,000 to 500,000 visitors to Western NY and the Finger Lakes region. Most will arrive for the weekend. What does this mean? I have 16 family members and friends coming from out-of-town, so I have noted the following.

First, if you have out-of-area guests coming, you should have hotel rooms reserved. They are in short supply and with few exceptions, rooms for that Monday night are now going for \$499 and up.

Second, make sure you have scouted and picked a good location. Because we'll be on daylight savings, the sun will be relatively high (51°) at the start of the eclipse at about 2:07PM in Rochester but somewhat lower (43°) when totality begins at about 3:20PM. Because of our latitude, the highest the sun ever gets (summer solstice) is 70°. The sun will be in the South-South-West, so you want a clear view in that direction. Perhaps, if not too many trees close in, your own backyard will do.

Third, if you are traveling to your favored viewing site with everyone else also trying to get to a good location, you will find that traffic on April 8 will be much heavier than usual even with most schools and some businesses closed. Wherever you are going, leave early, and pack for the day. If you are an ASRAS member and are planning on being at the Farash Observatory, make a reservation, as space and parking is limited. Immediately after the eclipse, with everyone leaving, there may be gridlock on the roads. Wait.

Fourth, besides the roads and hotels, other infrastructure may be stretched. Cell phones may have delays and there may be gas lines. Fill up before the weekend. For more information, see <https://www.monroecounty.gov/eclipse-2024>.

Eclipse Glasses: DO NOT forget to have enough eclipse glasses for everyone in your party. It is easy to share glasses during the lead up to and after totality, and during totality you will not need the glasses. As noted earlier, they block 99.999% of the visible light and 100% of harmful ultra-violet and infrared. See the

American Astronomical Society website (<https://eclipse.aas.org/eye-safety>) for more on this. I will have a pair of glasses for each of my guests. They'll make good souvenirs.

You'll know to take them off because with them you'll see only black when totality starts. Do not miss "Bailey's Beads" or the "Diamond Ring". See the stars and planets around the eclipse (and maybe a comet).

(<https://www.democratandchronicle.com/story/news/2024/02/20/solar-eclipse-2024-where-is-the-best-place-to-see-eclipse-april-rochester-ny/72665999007/>) The Rochester D&C (Democrat and Chronicle) recommends several viewing sites including High Falls, Ontario Beach Park, Cobbs Hill Park, Genesee Valley Park, Parcel 5, and Highland Park in Rochester; and Mendon Ponds Park, Durand-Eastman Park, The campus at the State University College at Brockport, and Hamlin Beach State Park elsewhere in Monroe County. These sites will all have large crowds, which will give them a party atmosphere.

Rochester Museum and Science Center Roc the Eclipse Festival: Note that the RMSC and their festival on East Avenue is also on the D&C list. See <https://rmsc.org/roc-the-eclipse-festival/> for details. Events include over 30 Rochester exhibitors and organizations with hands-on activities (including ASRAS), Solar telescope viewing, Planetarium shows (included with admission), live stage concert entertainment including the ROC City Ballet, The Isotopes, and comedy groups. Entertaining speakers including Dr. Phil Plait (the 'Bad Astronomer') on astronomy and science education and Cate Larsen (the 'Groovy Geologist'). There will be food trucks, the Giant Eclipse Glasses, and more activities inside the museum.