



WHY, HOW, AND WHERE TO VIEW TOTALITY

Make your plans now to experience the August 2017 Great American Eclipse!

By Charles Fulco

After reading the previous articles in this series on the upcoming August 21 U.S. Total Solar Eclipse (TSE2017), I hope you are now confidently prepared to teach about and safely observe this spectacular celestial event. Even so, you may still have some questions as you consider viewing the eclipse:

- Why should I get to the path of totality—isn't just seeing the partial eclipse good enough?
- How should I plan on observing the eclipse?
- Where is the best place to see it?
- What are the best resources to access for both me and my class?

These are all good questions and important ones, since it is necessary to be prepared for such a rare and educationally important event. To summarize what was discussed previously in this series about the 2017 Great American Eclipse, TSE2017 is:

- the first total solar eclipse in the continental United States since 1979
- the first total solar eclipse to be seen coast-to-coast in the United States since 1918
- the first total solar eclipse in the United States in the age of widespread social media
- an opportunity for teachers and students to experience the most spectacular celestial sight in nature

- a unique and exciting way to integrate NGSS, STEM, and cross-content learning into your elementary curricula

Why?

Totality is so much more than these bullet points. Since most people—including teachers—have never seen a total solar eclipse, it is difficult to describe why you (and if possible, your students) need to be in the path of totality. Every word written and every picture taken simply cannot do justice to what you will experience when you are under the Moon's umbra. As a veteran of four totalities on four continents, let me put aside the educational issues I've discussed in the previous articles in this series for a moment and talk about the things no textbook ever does—the pure emotion and experience of the event itself. This is not an inappropriate thing to do, because if we instructors don't have a passion for at least some of the topics we teach, then we have failed as educators in instilling that same passion in those we are charged with teaching. Herewith, then, is *why* you need to see this year's eclipse.

As mentioned earlier in this series, the Sun is 400 times larger than our Moon, but it's also 400 times farther away from the Moon as seen from here on Earth, which causes the two celestial bodies to appear to be virtually the same size in the sky. Sometimes, due to its irregular orbit, our closest celestial neighbor in space appears to be slightly smaller when eclipsing the Sun, and sometimes

slightly larger. It is the latter times that allow it to completely cover the entire disc of the Sun. If the Moon never appeared at least as large as the Sun, we would never see a total eclipse (interestingly, the Moon inches away from the Earth in its orbit each year, and many millions of years from now this gradual recession will eventually result in the final total eclipse that anyone will ever see—what a sad day indeed that will be). Thinking of this incredible celestial coincidence when experiencing a total eclipse always makes me appreciate it that much more.

I became an “umbraphile” after seeing my first eclipse as a child. It was 96% partial in the New York City area, which I thought would be good enough to see all the phenomena associated with totality, but I was so wrong. While it did get eerily dim for over an hour, none of the sights I would’ve seen had I ventured the several hundred miles to get into the path of totality presented themselves. The Sun is so intensely bright that even a 99% partial doesn’t provide the most valuable experience—it is, in fact, some 10,000 times brighter than a total eclipse!

Another “why” to be in the Moon’s path is that the phenomena associated with total solar eclipses are some of the most beautiful sights you will ever see in the natural world. Again, words, even the most poetic and descriptive, fail here. An observer’s senses become overwhelmed by the sights you can’t see at any other time—the vivid neon pink of the chromosphere and prominences; by the pearly and otherworldly glow of the Sun’s corona around the black disc of the Moon; and by the two diamond rings of sunlight that signal the beginning and end of totality, respectively. That’s just in the sky—there are plenty of dynamic things taking place in the air and on the ground even before totality begins that make you aware that something strange is about to take place. Watch as the daylight grows inexplicably dim and objects turn steely grey, the temperature drops, a

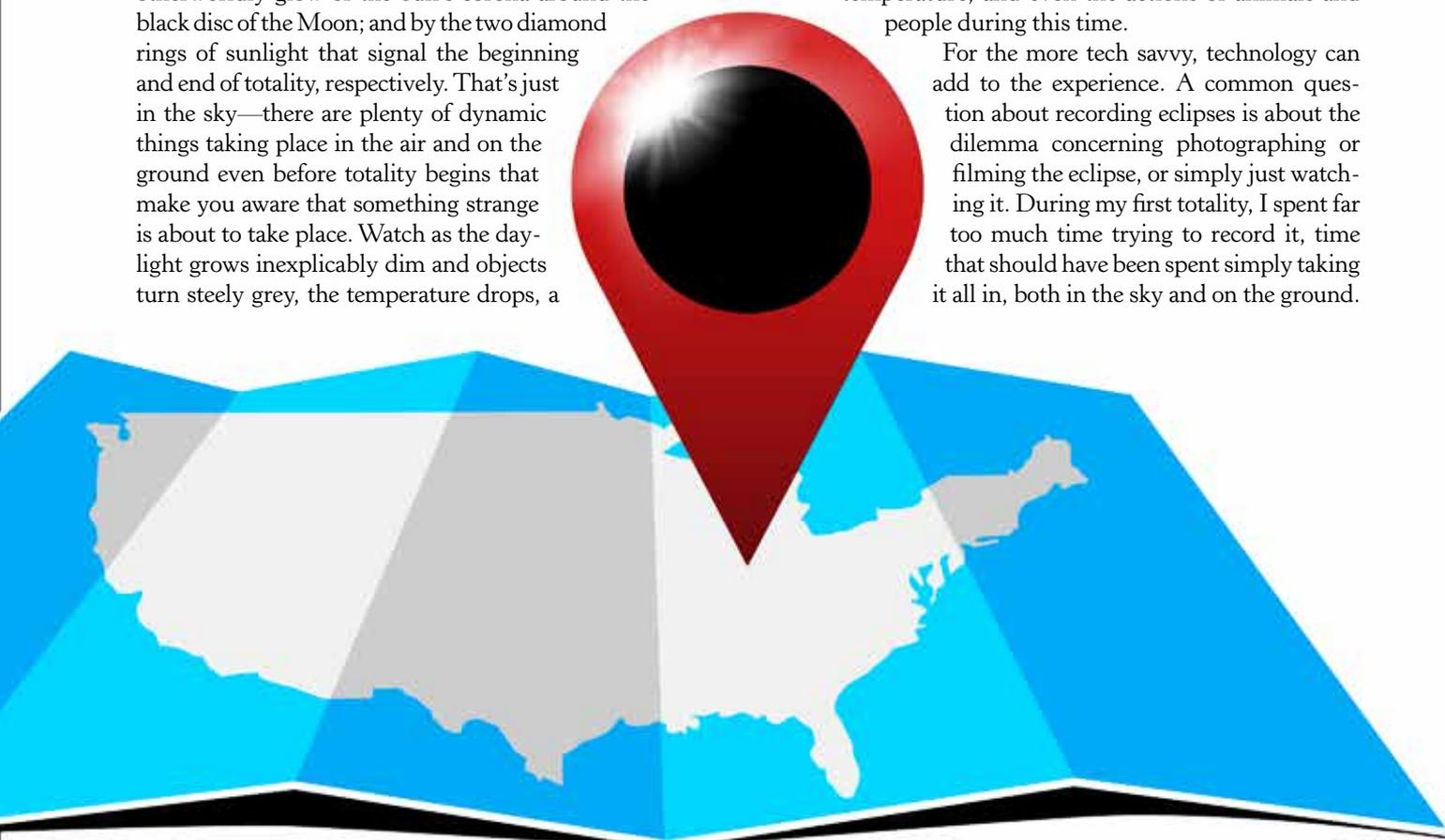
breeze picks up, and shadows become abnormally sharp as the disc of the Sun is reduced to a sliver of light. At this point, watch for birds and mammals returning to their nesting places as if it were an unusually early sunset!

As the seconds close in on the onset of totality, you may feel the hair on your skin begin to rise, as if some primordial instinct is telling you something dreadful is about to happen. I’ve always thought about the people who didn’t know what was occurring and how their reactions might have been as they watched the only source of life slowly vanishing, without the benefit of science to help them understand what was taking place in the skies above their heads.

How?

Previous articles in the series have focused on how to safely observe the eclipse (Fulco 2017a–d). There are also many web resources available to prepare you (see Internet Resources) for both the partial and total stages. Eclipse viewing does not require expensive equipment—an exciting and engaging way to show the shrinking Sun to a group of students is to produce crescents using pinholes in objects like colanders, pegboards, solar viewers, or simply stand under the leaves of trees and see the thousands of tiny crescents projected onto the ground below. The partial stage before totality lasts about an hour, so there is plenty of time to observe and record the changing light, temperature, and even the actions of animals and people during this time.

For the more tech savvy, technology can add to the experience. A common question about recording eclipses is about the dilemma concerning photographing or filming the eclipse, or simply just watching it. During my first totality, I spent far too much time trying to record it, time that should have been spent simply taking it all in, both in the sky and on the ground.



At the next one, I didn't record it at all and regretted afterward not having one image to show people. Now, I like to do both—I set up my digital SLR camera and video camera on tripods and have them record automatically while I watch the eclipse and sear it into my memory. If like many, you only have a smartphone or point-and-shoot camera to use, I recommend using it to record video (use the wide-angle setting to capture the entire scene), which allows you to see and hear the reactions of your fellow spectators. For information on how to set up your cameras for both the partial and total stages, see www.eclipse2017.org/2017/photographing.HTM.

Many teachers ask me if observing the brief period of totality should include certain activities related to the lessons they'll have completed during the school year. As a veteran science teacher and a veteran of four totalities, I can honestly answer that you should feel free to try to get your experiments and investigations and activities in, but remember you'll have an extremely limited and frantic timeframe in which to accomplish things. If all your planning and instructions for experimentation and scientific observations suddenly goes by the wayside, and all you and your students can do is stare wide-eyed at the unearthly spectacle above you, rest assured you're in good company down through the ages. Countless renowned solar scientists have been stopped in their tracks at the sight of totality and all hopes of gathering observational data gone, through the sheer emotion of the sight.

If all this still can't explain why you need to put yourself in the path of totality on August 21, perhaps reading about how total eclipses have impacted the course of history through the ages will (see Internet Resources). Scientists for centuries have traveled thousands of miles for a few precious minutes of totality, often across hostile terrain and through enemy territories. Now, amateur eclipse chasers routinely fly to the far reaches of our globe to experience it. You have the opportunity to see what people have traveled around the world to see, right in our home country, and as teachers, this should be all the convincing you need. So, once you have decided to be within the Moon's umbra, the question is, where to see it?

Where?

As noted before, TSE2017 is a coast-to-coast event in the United States—the first time this has occurred since 1918. Beginning in mid-morning, the Moon's umbra will cut a diagonal swath from the coast of Oregon through the Rocky Mountains, across the Great Plains, through the nation's heartland, and finally into the southeast. The umbra leaves U.S. soil off the coast of South Carolina by mid-afternoon, all within the span of about 90 minutes. This leaves the observer with many potential viewing sites but also with many questions about where the “best” place is

to observe. With total eclipses, there is really no one best site, since different locations offer different possibilities for viewing. Let's take some of these into consideration:

- **If you are only interested in the longest duration of totality, then the southern Missouri-Illinois-Kentucky area is for you.** At these locations, you will see (weather permitting, of course) almost two minutes and 40 seconds of totality, the most along the entire track. I am planning on being in this area to help coordinate an Eclipse Weekend of activities centered on the campus of Southern Illinois University in Carbondale and the neighboring town of Makanda, Illinois, which has the eclipse's centerline painted in orange right through its little “downtown” of stores. With the large football stadium already reserved and Giant City State Park down the road, this area can easily accommodate the huge number of visitors predicted to arrive.
- **If you want the best weather prospects, head to eastern Oregon.** The city of Madras and the surrounding areas have the best forecasts for clear skies on eclipse morning, thanks to the arid climate east of the Cascade range. You can sleep peacefully the night before knowing that the Eastern Oregon area has the best chances for clear skies along the entire path. The negative prospects of coming here are the certain traffic jams and lack of major highways. You may need to camp out, since accommodations in this totality-friendly area are long sold out. Mt. Hood and Hood River are unfortunately just north of the path but close enough to consider exploring those areas both before and after the eclipse. For other weather prospects along the path, visit <http://eclipsophile.com>.
- **If you are looking to hang out with a few hundred thousand fellow eclipse chasers under the Moon's shadow on a runway, consider attending the huge gathering at the St. Joseph, Missouri, airport.** Hosted by *Astronomy* magazine Senior Editor Michael Bakich, this event at Rosecrans Memorial Airport will let you experience two minutes and 39 seconds of totality, only one second short of the maximum time possible (see Internet Resources). As Bakich says, “We'll have astronomers on hand to explain what's happening and lots of safely filtered telescopes you can view through. Weather prospects are great, we have plenty of room, and it's free! Join us for 2017's largest eclipse viewing party and one of the greatest public observing events in history. You'll remember it for the rest of your life.”
- **If you want to be the first person in the United States that the Moon's umbra touches, stand in the surf on the Oregon coastline at Lincoln City.**

The only problem is, you may not see it, due to the ever-present morning fog along the shore at the time of this mid-morning event.

- **If you like southern hospitality and history, check out Nashville and Charleston.** The former is the largest city completely within the path of totality, while the latter is the last big city the eclipse touches before heading out over the Atlantic. Both locales offer plenty to see and do (and eat!) before, on, and after eclipse day.
- **If you want to photograph the eclipse with gorgeous scenery in the foreground, try a national park.** Grand Teton, Yellowstone, and Great Smoky National Parks lay within the path. If you're high enough and have unobstructed views, any should offer spectacular views of the approaching and departing lunar shadow. Again, traffic concerns could be an issue here, especially if the weather deteriorates and mobility becomes a last-minute issue.
- **Watch it in solitude.** Many eclipse chasers can't imagine not watching such a life-changing and spiritual event alone, the ultimate communing with nature.
- **If you are lucky enough to live and teach within the path of totality, your neighborhood and school may be the best place.** How fortunate are those who live and teach where the eclipse comes to them! It's not often that you can step outside your house or school and see a total solar eclipse (in fact, it's about every 360 years or so, on average). For these lucky ones, there is absolutely NO excuse to miss totality, and I mean NONE!

This being said, I realize that most U.S. citizens (including teachers) will not see totality on August 21, but will instead see a partial eclipse due to family or work obligations, travel issues, or other logistics that will make it impossible for them to travel to the umbral path. But all is not lost—a partial solar eclipse is still a significant event to observe and record, and many investigations and activities can be accomplished during the eclipse. As you can see from the maps at *GreatAmericanEclipse.com* and *Eclipse2017.org*, the percentage of the Sun that is covered by the Moon decreases the farther away you are from the path of totality. Those in the southern part of Kansas City and the northern part of St. Louis get a 99% partial, New York City will see about 76% of the Sun being covered, while those at the northern tip of Alaska will see just 22%. But with this eclipse, every state (and school yard) in the nation gets a chance to see at least part of it. And this path of totality falls *only* upon the United States and no other country, for the first time since we became a country. No wonder it's being called the Great American Eclipse!

Thank you for taking the time to read this series of articles devoted to TSE2017. We, as teachers, are invested with the responsibility of introducing our students to as many scientific phenomena as we can, and preferably not just using a text or videos. Sometimes we are constrained by budgets, sometimes by rules, and sometimes by simply not knowing. In the case of the 2017 U.S. Total Solar Eclipse, I plead with every teacher and administrator to not let ignorance nor fear be an obstacle of authentic learning. As I've stated at every science conference and school at which I've presented over the past two years: *If you are within a day's drive of totality, my advice is to make every reasonable attempt to get you and your students there.* I have been a student, athlete, and teacher on daylong drives to field trips and sports or music competitions. If schools can raise funds and make the effort for those events, there is absolutely no reason the same can't be done for TSE2017.

I look forward to receiving your emails with photos, videos, and other reflections of Eclipse Day, so I may compile and share them afterward. Wherever you and your students are on August 21, 2017, I hope you enjoy your experience, and remember—No Child Left Inside! ■

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Internet Resources

Historic Eclipses

www.history.com/news/historic-eclipses

How to photograph an eclipse

www.eclipse2017.org/2017/photographing.HTM

Map of umbral path across the U.S. eclipse2017.org

www.eclipse2017.org/eclipse2017_main.htm

GreatAmericanEclipse.com

www.greatamericaneclipse.com/best-places-to-view

Weather prospects

<http://eclipsophile.com>

2017 Total Solar Eclipse: St. Joseph, Missouri

www.stjosepheclipse.com

References

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