

## MOUNTAINS

## Eclipses can permanently damage eyes

## Viewing on TV is safest; special glasses can help

Eduardo Cuevas

USA TODAY

When the ophthalmologist looked into a 26-year-old New Yorker's eye in 2017, it was a worst-case scenario. The distinctive contours of the solar eclipse the woman stared at days before were etched onto her retina.

The case of the Staten Island woman who watched the eclipse through faulty glasses was notable enough to be chronicled by doctors from Mount Sinai's New York Eye and Ear Infirmary in *JAMA Ophthalmology*, a medical journal — because these cases, luckily, are rare.

"It's a very focused beam of high-energy light from the sun itself," said Dr. Avnish Deobhakta, an ophthalmologist at the Mount Sinai infirmary who treated the woman. "It can actually destroy parts of the retina, and certainly destroy it in the shape of an eclipse."

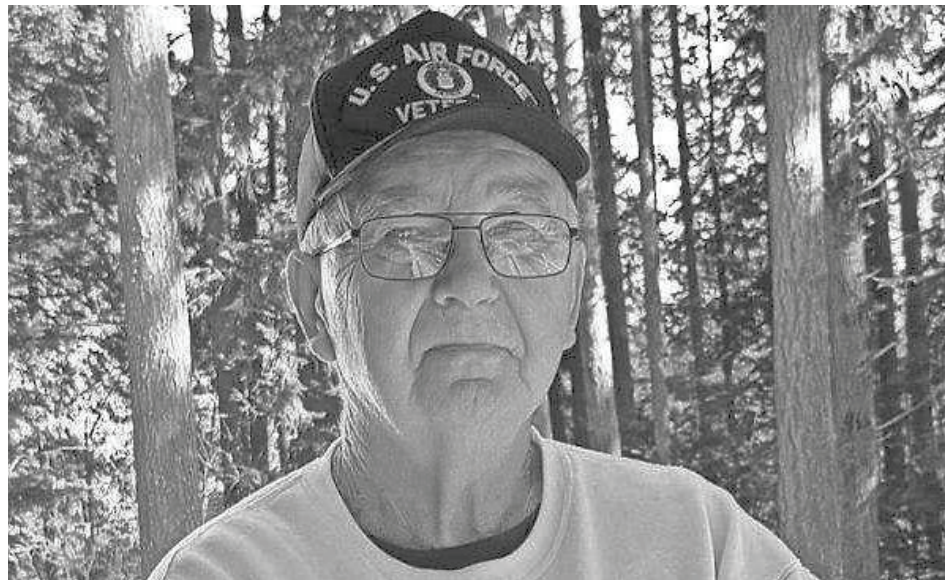
The woman told Mount Sinai doctors she had gazed at the moon passing in front of the sun through what she believed were protective glasses. About four hours after she watched the eclipse, her vision became blurry and colors distorted, according to the *JAMA* report.

In scans, the damage on her left retina, the area at the back of the eye where the brain receives images, resembled the shape of a partial eclipse. She told a local TV station that year when she closed her eyes, she saw a sun-eating-moon image that "looked like Pac-Man" or "a crescent moon."

While rare, eye damage from watching a partial eclipse happens because a person's natural response to squint when looking at sunlight does not get triggered. In the lead-up to the April 8 solar eclipse, doctors and a rare set of eclipse watchers are warning about watching this planetary event without adequate eclipse glasses or with the naked eye.

It's hard for experts to know or even estimate how many people experience eye damage from solar eclipses.

The 2017 eclipse, which passed from



After looking at a partial eclipse for about 20 seconds as a child, Louis Tomososki, 77, developed a grayish spot in the middle of his right eye. "I'm more aware of it than your average person walking down the street," Tomososki said.

PROVIDED BY LOUIS TOMOSOSKI

Oregon to South Carolina, is thought to have caused about 100 cases, according to the American Astronomical Society. A national survey by NASA and the University of Michigan estimated more than 150 million people witnessed that eclipse.

The 2024 eclipse is expected to have more people watching because it is passing over several large cities in the U.S. and Mexico. And experts are making it clear that people should plan before heading outside to stare at the sun.

"Human nature is to take a shortcut anywhere we can," Dr. Ron Benner, an optometrist in Montana and the president of the American Optometric Association, told USA TODAY. "But in this case, shortcuts can be permanent and can cause damage."

## Deceptive, dangerous light

Looking up within the 115-mile-wide path of the total eclipse when the moon completely covers the sun is less dangerous, experts say. But watching before and after the complete eclipse or watching a partial eclipse can leave people with permanent damage, including blurred or altered vision.

When there isn't an eclipse, humans naturally squint or are forced to look away from the sun's brightness.

But during a partial eclipse, the moon's shadow allows people to stare at the sun longer without experiencing that intense glare. The high-energy rays cast down during that time are akin to a laser pinpointing the eye. Without feeling the usual sting in their eyes, people are exposed to harmful rays for a longer period, Deobhakta said.

There's a misconception that eye damage of this nature is a sunburn, said Benner, from the optometric association. Dangerous light and radiation exposure, when you turn your eyes directly to the sun, can permanently damage retinal cells at the back of the eye. The retina plays an essential role in helping the brain process images.

## Safest viewing options

The safest way to avoid eye damage, is, of course, not looking at the partial eclipse. Although few are as cautious as eye experts, Deobhakta and Benner recommend watching the upcoming eclipse on TV.

A very safe way to watch is to turn

your back to the eclipse and watch its shadows using a pinhole projection of light. You can create a pinhole by criss-crossing your fingers and letting the light project through them onto the ground. You can also hold up an index card with a hole in it or a pasta colander or any item with small holes and let the sunlight pass through it onto the ground or a wall.

You can also use specially designed glasses. The American Astronomical Society publishes a list of approved glasses that meet the international standard of ISO 12312-2, meaning they will protect your eyes from injury and provide a comfortable view of the eclipse.

Rick Fienberg, project manager for the American Astronomical Society's solar eclipse task force, reviews reports on the glasses to ensure they've been adequately tested. He warned that people should avoid products that haven't received the ISO label, or sites that claim they've received a label but haven't.

## Friends warn of dangers

Childhood friends Lou Tomososki and Roger Duvall, both 77, have told cautionary tales for years about the day in the early 1960s when each of them burned an eye squinting up at a partial solar eclipse.

The two men, teenagers at the time, watched without protection from the baseball diamond at their high school in Portland, Oregon. Tomososki, a retired semitrailer truck driver, and Duvall, a former employee at a rental car company, remember their science teacher telling them about the upcoming eclipse and warning about eye damage.

After looking at the eclipse for about 20 seconds, Tomososki developed a grayish spot in the middle of his right eye, while Duvall now has a similar dark spot in his left eye. Duvall said he visited a doctor the day after the eclipse when he noticed his vision loss.

During a phone interview, Tomososki mentioned that he was looking at a daffodil from afar, but the blot in the middle of his eye blocked the yellow bulb. Instead, that portion of the flower looked like when a face is blurred on TV.

## WORD FROM THE SMOKIES

## Specialists converge to name hundreds of flies

Holly Kays

Word from the Smokies

Two decades ago, thousands of flies, bugs and beetles met their end in insect traps set up at 11 sites around Great Smoky Mountains National Park, part of a still-young effort to catalogue every species found within the park's 800 square miles. From there, the insects were taken to the park's Twin Creeks Science and Education Center, pinned, placed in drawers, and — for the most part — left untouched ever since.

That is, until last month. Discover Life in America, which manages the All Taxa Biodiversity Inventory project to document every species that lives in the Smokies, held its first-ever ID Blitz March 1-3. Rather than roam the outdoors looking for new observations to log, as occurs in the bioblitz events DLIa often hosts, the ID Blitz brought in specialists from all over the continent to put names to the thousands of fly species contained in the collection.

"There are probably thousands of new species records for the park among this material and probably hundreds of new species to science just sitting here, languishing in this lab space," said Will Kuhn, director of science and research for DLIa. "So we decided to bring the energy of this bioblitz concept but have it be focused on stuff that's already been collected."

For two and a half days, 11 people — including Kuhn, three park employees, and seven fly specialists — spread out through two rooms in the science center, sorting through drawers of dried flies. Working a combined 131 hours, they sorted 1,500 flies to at least the family level and 500 beyond family to genus or species. Of those, 49 are likely new records for the park, equivalent to 16 percent of all new species added last year, though DLIa is still working to confirm this status. Additionally, scientists pointed out scientific literature that notes six fly species not on DLIa's current list that have

previously been documented in the Smokies.

"Even after the event," Kuhn said, "a couple of them have been sending us other links to papers like that. ... It's the gift that keeps on giving."

The scientists sorted themselves into two groups, with some placing the flies into taxonomic families while others concentrated on already-sorted specimens within their area of specialty, working to identify them to genus or species. At various times in the past, the park has found funding to bring an individual specialist to the park to work on the backlog, but this setup was much more enjoyable and productive, said Smokies Science Coordinator Paul Super, who has cultivated an expertise in identifying flower flies.

"Sometimes it's just easier and more fun if you bring everybody together for a particular large group, like flies in this case," he said.

Katja Schulz, who works as a data scientist in Washington, D.C., but has maintained a love for fly identification since completing her Ph.D. in entomology years ago, said spending time with the other fly specialists was as big a part of the attractions as exploring the collection. In addition to their days at Twin Creeks, the group took a couple short hikes, ate together, and stayed at the same Airbnb. Support from Friends of the Smokies made it possible to cover travel, food, and lodging for the visiting specialists.

"When you're a scientist, your heroes are not so much people who are in the movies or in music," Schulz said. "You admire scientists who have done important work, and in this case, in entomology, and some of those people were at this ID Blitz."

According to Bradley Sinclair, a fly specialist with the Canadian Food Inspection Agency and Canadian National Collection in Ottawa, wings are key to fly identification. Their distinctive vein pattern allows a trained eye to immediately

discern which group of flies the specimen belongs to. From there, features like color, patterns in the hair and bristles, lobes on the body, and characteristics of the eyes and antennae offer clues to nail it down further.

"If it's my specialty group, I can usually get it to genus on sight without a microscope or any sort of magnification, just from experience," Sinclair said. "You use a microscope to confirm the genus, and then the features to get beyond that usually are more microscopic."

The specialists used taxonomic keys, scientific papers, books, and species checklists to help make their identifications, but they also sought help when those tools didn't do the job.

"Folks were shouting back and forth, trying to learn from each other when they've got an unusual specimen they're trying to look at," said Super.

But identifying some specimens required an even bigger team, as was the case with a tiny fly measuring less than half a centimeter in length.

"One of the other participants and I struggled even to get it to a family level it was so bizarre-looking," Sinclair said.

After reaching out to colleagues scattered around the world, they were able to identify it as *Lepidodexia hirculus*, a species that had previously been reported only in Texas.

The scientists sought outside help for two additional finds as well. Unlike the *Lepidodexia hirculus*, which was part of the collection, these flies were spotted on a group hike at Chestnut Tops Trail. The first was a fly found perched on a dead snail, identified as *Amoebaleria defessa*, a species that had been documented in the park only seven times before. The second was a member of the *Ophiomyia* genus, a leafminer, found on a solitary pussytoe plant. This marked the first time a leafminer of any kind had been recorded on this species anywhere in the world.

Such finds underscore how little is known about many of the species with

which we share our world—and how much remains to discover. Especially when it comes to flies.

"Most people don't really pay attention to them, so they're one of the underdogs in the entomological world," Schulz said, "one of the more diverse families but not as intensely studied as some other groups."

Sinclair said he's described more than 400 fly species in his career so far, but an "endless stream" of others wait to be identified.

"Even in North America, I find, when I do a study, about one-third have a name and two-thirds are unnamed," he said.

Learning that a species exists is just the first step to unlocking the secrets of its impact on the earth. Flies are diverse in more than just looks — they play a dazzling array of roles in the ecosystems they inhabit. Flies pollinate flowers, transmit diseases, turn dead animals into rich soil, dole out painful bites, and clean dirty water, all niches that exert a powerful influence on the health of the larger environment. But for many species, humans remain ignorant of exactly what that influence is.

"Knowing which species are here is important," Kuhn said, "so that we can better understand how these different species are connected, which species are most vulnerable, and where the hotspots for biodiversity are in the park, so that these species can be protected."

Flies, these "underdogs of the entomological world," help hold it all together. "Without them," said Super, "the whole ecosystem would fall apart."

Holly Kays is the lead writer for *Smokies Life*, formerly called *Great Smoky Mountains Association*. Reach her at [hollyk@smokieslife.org](mailto:hollyk@smokieslife.org). *Discover Life in America*, which like *Smokies Life* is a nonprofit partner of *Great Smoky Mountains National Park*, has catalogued 21,799 species in the park since it launched in 1998, of which 11,004 had never been previously recorded in the park and 1,079 were new to science.