Don't miss sunballs during a solar eclipse

Jay M. Pasachoff's informative letter advocating that more students partake in eclipse events is to be applauded.[1] As an alternative to looking skyward during solar eclipses, consider the startling view that occurs when viewing pinhole images of the Sun cast through openings between leaves in a sunlit tree. In the left photo I'm standing outside a classroom at my school where such images are evident on the ground and the wall, before the Sun is eclipsed. As the Moon progresses in front of the Sun, the round spots of light become crescents. And with an added benefit: no danger to the eyes of students who look on. Since the May 2012 partial eclipse occurred on a Sunday, I offered my students credit for capturing "before and during" images like the one accompanying this letter, taken near their own homes. They enjoyed the experience and said their friends and family had no idea about this phenomenon.

1. Jay M. Pasachoff, "2017 solar eclipse," *Phys. Teach.* **54**, 68 (Feb. 2016).

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Jay Pasachoff replies

I certainly agree with Dean Baird about the fun in watching pinhole images of the crescent Sun during a partial solar eclipse [Jay M. Pasachoff, "Eclipse pinhole images," *Am. J. Phys.* **82** (4), 269 (April 2014)], but I do hope that he is encouraging his students and their families to travel into totality for the August 2017 eclipse. From Sacramento, CA, 83% of the solar diameter will be covered by the moon at maximum (you can click on your location to see local circumstances at Xavier Jubier's interactive map: http://xjubier.free.fr/en/site_pages/solar_eclipses/xSE_GoogleMap3.php?Ecl=+20170821&Acc=2&Umb=1&Lmt=1&Mag=1&Max=1&Map=ROADMAP), not even enough to make a dramatic darkening. The 500-mile drive north to the zone of totality would be worthwhile, if it all possible—and would be appreciated particularly afterward because of the drama of the diamond-ring effect, Baily's beads, and the solar corona in totality with darkness descending all around.

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Singing cymbals and radiometers

The article about singing cymbals that appeared in the April issue of *The Physics Teacher*[1] is very delightful.

The authors' conclusion, that photon-induced thermal effects are the "cause" of the singing, is similar to that of the famous Crookes' radiometer, https:// en.wikipedia.org/wiki/Crookes_radiometer. In both cases, the effect is more due to absorption of photon energy than momentum.

It was Compton's experiment (1923) on the scattering of light by electrons which generally convinced the physics community that photons carry momentum as well as energy: https://en.wikipedia.org/wiki/Compton_scattering.

Kudos to these authors for some great scientific sleuthing!

1. Samantha Collin, Nikki Etchenique, and Thomas Moore, "The singing cymbal: Is it really photon momentum?" *Phys. Teach.* **54**, 209 (April 2016).

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Revisiting $E = mc^2$ and the February issue

I received my print copy of the February issue last week and so far, have enjoyed reading it. However, the first thing I noticed on the cover image was a problem with what the artist put on the blackboard. If you just write $E = mc^2$, m should not be labeled as the rest mass, unless E is also labeled as the rest energy. Current practice favors writing $E = \gamma mc^2$, rather than having m be the relativistic mass.

Edw. S. Ginsberg
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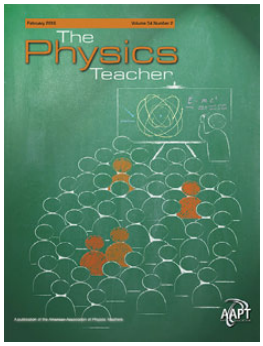

• ***Editor's response:*** While we might also have preferred that the teacher had noted on the board that "E" meant rest energy, we are optimistic that we captured the teacher mid-sentence, and further, that the full lesson was above reproach and avoided propagating subversive or dated views about relativistic mass.