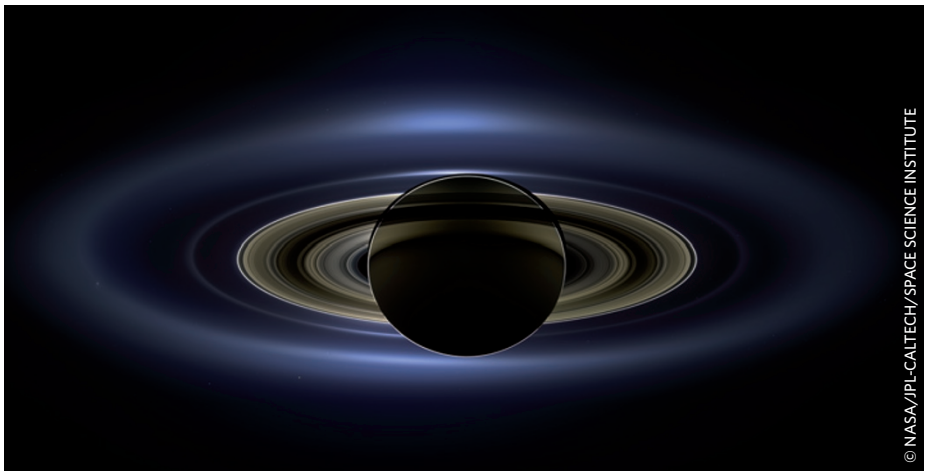
The day the Earth smiled

A mote, no brighter than a star, is how Earth appears in the background of a spectacular photograph of Saturn that was captured by the Cassini spacecraft in July 2013 and released to the public on 12 November. It was not the first time that Earth had been photographed by a deep-space mission, but it was the first time that 'Earthlings' were told of the picture ahead of time. On 19 July — dubbed 'the day the Earth smiled' by NASA — thousands of people stepped outside to wave at Saturn during the fifteen minutes that Cassini's cameras were pointed towards Earth. According to a *Sky & Telescope* blog, the odds that a photon from any individual's outstretched arm actually reached Cassini's camera was roughly one in a million (http://go.nature.com/wgsTVs).



The photo wasn't just a vanity shot. In fact, Earth's presence in it was a happy accident as a result of the fact that, at Saturn's distance from the Sun, Earth always appears close to the Sun in the sky. Scientists who study faint, dusty particulate phenomena such as planetary rings and comet tails like to view them at extremely high phase angles — when the Sun is nearly in front of the observer — because the dust becomes brightly visible, just as dust motes in a sunbeam do. In this particular image, Cassini was staring in the direction of the Sun, but the Sun was blocked out by the bulk of Saturn's globe. In total, Cassini spent four hours observing the ring system while in Saturn's shadow, taking 323 photos as well as hundreds more observations with its three spectrometers.

All of the dusty portions of Saturn's ring system shine brilliantly, scattering light from the Sun towards Cassini. These include the outermost, blue E ring, made from ice crystals that Enceladus's south polar geysers are actively spewing. Enceladus and its geysers are themselves visible within the E ring at the 8 o'clock position in the image. A previous, similar observation in 2006 revealed that the E ring varies in brightness and colour. The 2013 photo will allow scientists to look for change in the distribution of E-ring particles after the passage of one Saturn season. The 2013 photo has also verified the hypothesis that Saturn's fainter dusty rings — including the one occupying the orbit of the recently discovered moon Pallene — are not discontinuous, but instead form complete circles around the planet.

Cassini's observations utilized different colour filters and exposure times to make every aspect of the planet and its ring system visible. Assembling the images into a mosaic was a Herculean task that took months of artful work by imaging team members Daiana di Nino and Carolyn Porco, who processed the image for balance and beauty. For instance, the fainter rings have been brightened with respect to the main rings, as have the planets and a few of the moons. Compromises had to be made on the positions of moving objects such as moons and ring shadows so that all the images would blend into a seamless whole. The final product is as much art as science. ❐

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The Journalist's Take

This stunning photo was widely published both in print and online. Its visual impact propelled it to instant popularity in social media. People saw it, said "Wow!" and shared it with their friends.

Although there were dozens of news stories about the photo, few of them contained much information about how it was made. Most media outlets copied a few facts from the NASA press release and left it at that. Readers were invited to be inspired by the photo's beauty but were left wondering about its content.

The public's curiosity presented an opportunity for space bloggers like me. Through social media, members of the public asked good questions about the photo. Is it one photo or many? Is it art, or real? What is happening to the rings where they cross Saturn? In my own post about the photo, I explained how the Sun's light bounced off rings to light the nightside of the planet, or off the dayside of the planet to illuminate nightsides of moons Enceladus and Tethys. I showed how the different properties of the rings — some opaque and some transparent — affected their appearance where they were illuminated and shadowed. A couple of other space bloggers also used the popularity of the image as an opportunity to explain the science of Cassini and educate the public about its mission.

Before the rise of social media, it would have been the role of science journalists to discover the story of the photo and share it in the media, with quotes from the experts. Now, my role as a science journalist has changed. News travels very fast, and quotes from experts are provided directly to the public in press releases shared on mission websites. I rarely have a chance to actually break science news. Instead, I serve the role of interpreter and educator, commenting on and providing context for space news, and using breaking news stories as an opportunity to teach the public about related concepts or policy issues.

And on the subject of policy, although Cassini's extended mission is supposed to last until September 2017, US budget pressures may force NASA to end the mission — and our smiling at Cassini — two years early.